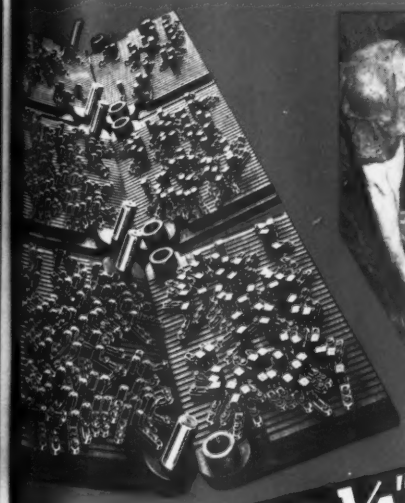
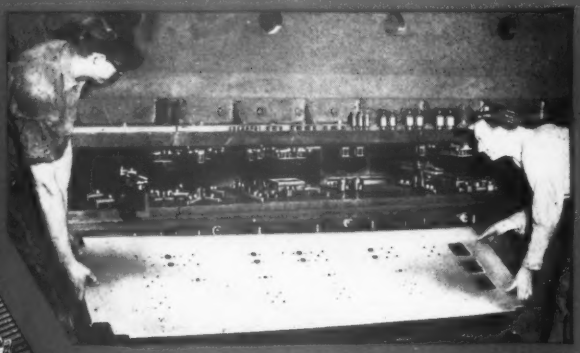
APRIL - 1947

TOOL & DIE JOURNAL

ESIGN, MANUFACTURE AND USE OF PRODUCTION TOOLING



Typical 3 section set-up of Whistler multi-use punch and die units.



An example of piercing standard size holes, special shapes and corner notching with Whistler adjustable dies.

PIERCE 1/4" STEEL WITH WHISTLER

MULTI-USE ADJUSTABLE DIES

Here's another production time and money saving advantage from Whistler. Now you can use the SX series of heavy duty adjustable dies for piercing materials up to and including 1/4" steel.

Punches and dies are available from stock in all standard sizes from 1/8" to 3" diameters. No time lost in getting into production. Absolute precision on short or long runs. Rearrange the same units... combine with notching, special shape or group dies if called for ...and go right ahead on the next job. Whistler adjustable dies have unlimited use and pay for themselves over and over. Work in practically any type press and ordinary skilled workers can make set-up changes.

Whistler Adjustable Dies are being used by the top names in industry everywhere...there are reasons aplenty. Tell us about *your* piercing problems. Send blueprints. No obligation in finding out why Whistler Adjustable Dies should be working in *your* plant.

S. B. Whistler & Sons, Inc.
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WHISTLER MULTI-USE ADJUSTABLE PERFORATING DIES

START WITH YOUR JOB

Half Finished

WHEN it's dies you're making—small or large—or various other forming tools or gages or certain fast-wearing parts of machines, FCC Tool Steel *Cast-To-Shape* can really save you money.

Very intricate shapes can now be cast in one piece within an eighth-inch of finished size. This means that you pay for less steel to begin with, and reduce machining time substantially.

Air Hardening, Oil Hardening and special Hot Work Tool Steels of various grades—each a thoroughly dependable performer in its class—are promptly available in this modern, economical form.

Any A-L Branch Office can give you full particulars, or write for data.

WRITE FOR THIS BOOKLET

It contains details of FCC Tool Steels *Cast-To-Shape* and of other important Forging and Casting Division specialties that may offer you money-saving production ideas. Get your copy—write for it today.

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STEEL CORPORATION

Forging and Casting Division

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does light machining and assembly operations up to 300% FASTER

This small, powerful Bellows "Controlled-Air" Powered Vise (Model CV40-B) makes possible smooth, rapid-fire machining of work pieces in such varied operations as drilling, reaming, tapping, sawing, filing, light milling, grinding and assembly operations.

Model CV40-B Bellows Air Vise will operate in any position, and can be easily synchronized to open and close automatically with the main machine cycle. It reduces operators' movements by eliminating waste motion and time required for hand clamping.

Positive control of clamping pressure (adjustable from 0 to 500 lbs. or more) permits the most fragile parts to be held tightly yet safely.

Write Today . . . .

For your copy of Bulletin CV40-BT and the new Foto Facts File with actual case histories of production increases ranging from 20% to 300% and more.

Integral valve, with operating lever, and speed controls. Vise may be operated by hand or foot, or may be readily synchronized to machine movement by linkage, cam, or solenoid.

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The Bellows Co.

ESTABLISHED 1911

Akron, Ohio

TOOL & DIE JOURNAL

Editorial and Publication Offices
2460 FAIRMOUNT BOULEVARD ● CLEVELAND 6, OHIO

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Subscription rate: To Schools, Libraries, Students, and other than CBI, $4.00 per year. Single copies fifty cents.

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in Socket Screw fastenings an ever increasing number of manufacturers are using Holo-Krome Completely Cold Forged Socket Screws because they can depend upon the Guaranteed Unfailing Performance of every single Holo-Krome Product . . . Specify "Holo-Krome".

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THE HOLO-KROME SCREW CORP. - **Hartford 10, Connecticut**

Cut Machining Costs

with GORTON Tracer Control

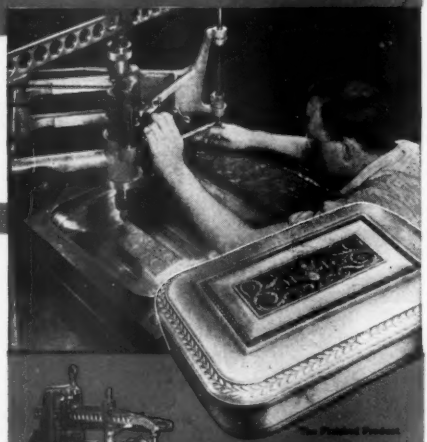
For Precision Machining on Work of Various Sizes

Beautiful plastic chests such as the one shown here are made possible by the painstaking and highly skillful craftsmanship of the engraver who engraves a master model which is then transformed into a die or mold through the use of a Gorton Pantograph with Tracer Control which mills or engraves with true fidelity every mark of the original engraver's tool.

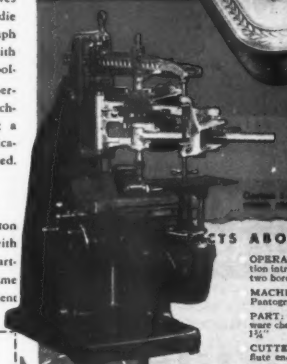
Tracer Controlled Milling is our term for Super-Speed precision milling, engraving, electrical etching or other metal removal operations using a Master pattern. There are many profitable applications for which this method is specifically indicated. It will pay you to investigate now.

Gorton Pre-Determines Results For You

Find out today if you can save money with Gorton Tracer Control. Send us a complete description with prints of one of your jobs. Our Engineering Department will prepare a production estimate on the same job tooled on Gorton Tracer Controlled equipment —no obligation.



Illustrated—distinctively designed canteen Silverware Chest in Ivory Plastic. For further details, write Marshall-White Co., 426 S. Clinton St., Chicago, Illinois.



FACTS ABOUT THIS JOB

OPERATIONS: Mill at 2 to 1 reduction intricate design in center panel and two borders.

MACHINE: Gorton 3-L 3-dimensional Pantograph.

PART: Mold for top of Plastic silverware chest; mild steel, 17⅝" x 12⅝" x 1¾".

CUTTERS: Gorton single and multi-flute end mills.

SPINDLE SPEED: 7400 R.P.M.

TIME: Total time including setting-up, cutter grinding and milling was 120 hours—a tremendous saving over any other method.

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3-A

For HEAVIER FEEDS at HIGHER SPEEDS

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A SINGLE SELF-CONTAINED MOTOR-DRIVEN UNIT

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- **18 feed changes for 1½" to 54" per minute make adjustment to any cutting speed simple and quick. An optional feed range from 3" to 108" is available.**
- **In addition to indexing and rotary milling, the usefulness of the Rotary Table is further widened by its adaptability to many other jobs where an automatic revolving fixture would save time and costly manhours.**

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MACHINERY COMPANY

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MORE GOODS for MORE PEOPLE at LOWER COST

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in the Press Room

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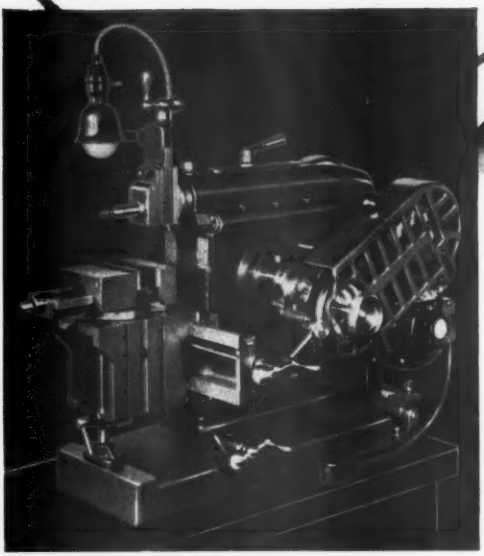
Yes Sir — for all kinds of Precision Work LOW PRICED AMMCO 7" SHAPER is a honey!



AMMCO 7" SHAPER—Bench Model

with swivel vise and wrenches, including 4 step V-pulley, adjustable countershaft, motor driven pulleys, 2 V-belts, adjustable lamp and switch. Belt guards and motor, extra. Net weight 175 lbs., shipping weight 225 lbs.

AMMCO 7" SHAPER—Portable Cabinet Model

complete with swivel vise and wrenches, including 4 step V-pulley, adjustable countershaft, motor driven pulleys and 2 V-belts, with belt guards; ½ H.P. Motor, 110 Volt, 60 Cycle, single phase and with overload switch; mounted on a maple cabinet with casters and handle for portability, and including adjustable lamp, completely wired and ready for operation. Net weight 300 lbs., shipping weight 400 lbs.

IT SAVES TIME...LABOR... CUTS PRODUCTION COSTS WAY DOWN

You can take it from me, our AMMCO 7 inch SHAPER is doing a job for us that saves time, cuts down production costs, makes money for us like no other shaper ever has.

There isn't a big machine that surpasses it in accuracy. It saves you time, floor space and expense in set-up operations . . . uses less electricity, is the perfect shaper for jobs requiring a 7 inch stroke or less.

At its low price, it's a buy you can't beat . . . precision guaranteed because AMMCO *builds the skill into the machine!*

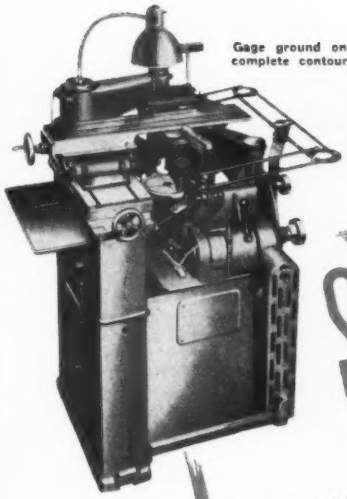
Write now . . . today for specifications and prices. Address Dept. TD-47.

AMMCO TOOLS, INC.

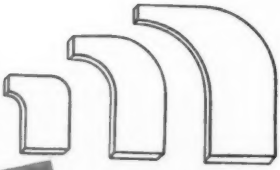
COMMONWEALTH AVENUE — NORTH CHICAGO ILLINOIS

(Formerly Automotive Maintenance Machinery Co.)

THE SKILL IS BUILT INTO AMMCO MACHINES



Gage ground on complete contour



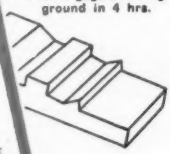
Various radius gages ground from same template

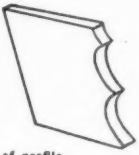
STUDER

PROFILE GRINDER

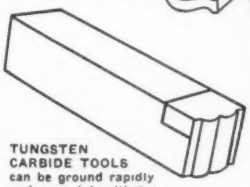
Circular form tool produced in 2½ hrs.

Profile gage 2.4" long ground in 4 hrs.





Set of profile gages produced in 3 hrs.



TUNGSTEN CARBIDE TOOLS can be ground rapidly and accurately with the Studer Profile Grinder. A special diamond wheel dressing device, equipped with a Carborundum cup wheel, assures accurate forming of bakelite and metal bonded wheels.

VERSATILITY!

Grind straight or round form tools, sectional dies, templates, small dies and precision parts! Work up to 6" in length, 4" in diameter, 2" in thickness can be handled. Special template holder permits grinding of circular contours over entire circumference.

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Only one set up is necessary for grinding any shape in one continuous operation, without removing work piece or template. Several flat pieces may be stacked for simultaneous grinding. Small profiles can be accurately produced without preliminary grinding to form, and clearances on parts such as form tools can be ground without changing the original setting.

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A tracer finger follows the form of a template and transmits its movements to the grinding wheel through a pantograph. Because the wheel is shaped proportionately to the exact shape of the tracer finger, parts are ground complete in one operation. Fixed template eliminates errors due to incorrect manipulation. These features insure accuracy to within ± 0.0002". Our engineers will give you expert assistance in specific applications.

Form tool ground on complete contour.

COSA CORPORATION

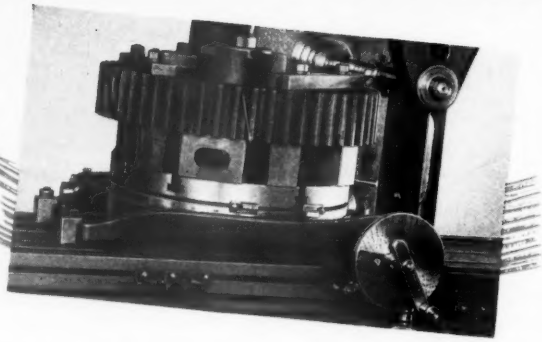
COSA

CHRYSLER BUILDING
New York 17, New York

Continuous Milling ends of toggle pins. The operator loads and unloads the work while the milling operation proceeds continuously. (U.S. Navy photo)

THEY GO 'ROUND IN CIRCLES

CINCINNATI



Index Milling the teeth of a large spur gear. The Circular Milling Attachment is equipped with an Index Devico for such work.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES

Above: *Circular Milling* concentric radii of rear crankshaft. 24" attachment — power driven.

Below: *Circular Milling* four lugs on aircraft bearing caps, relocating the cap for each lug. 16" attachment — power driven.

TO CUT COSTS

• Increasing the versatility of general-purpose machine tools is another way to reduce operating costs, because it enhances the possibility of keeping the machine busy throughout the working day. Some types of attachments are designed specifically for this purpose . . . CINCINNATI Circular Milling Attachments, for example. These attachments add hand and power rotary-feed to the standard straight line feed motions available on CINCINNATI knee-and-column type machines. This means you can assign three additional types of milling operations to your machine: 1) Circular (rotary) milling. 2) Continuous production milling. 3) Index milling (as for cutting the teeth of a large spur gear and similar jobs—indexing equipment extra). ¶ CINCINNATI Circular Milling Attachments, made in three sizes, 16", 20" and 24" table diameters; manual or power feed, could easily solve some of your cost-cutting problems. Don't overlook them. ¶ A complete review of all CINCINNATI Milling Attachments may be obtained by writing for catalog M-1382, and description and specifications of CINCINNATI Circular Milling Attachments are contained in catalog M-1035-2.

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NOW YOU CAN heat treat, harden and temper small parts in your own plant . . . *without experienced heat treaters.* Economical to install and use, Cooley Electric Furnaces operate efficiently at high or low heats, and save your large furnace time for work requiring large volume capacity. Here are some profitable uses:

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CHAMBER	8"W 6"H 14"L				10"W 6"H 18"L				8"W 6"H 14"L
FROM COLD	1850° F. in 55-65 min.				1850° F. in 55-65 min.				2000° F. in 2½ hrs.
AMPERES	14.8 at 230 v.				19.6 at 230 v.				20.2 at 230 v.
WATTS	3400				4500				4650
MODEL*	MH-3	VH-3	MK-3	VK-3	MH-4	VH-4	MK-4	VK-4	VK-5
PRICE	146.00	166.00	186.00	206.00	222.50	242.50	262.50	282.50	320.00

* M models complete with hinged door and hearth plate.
V models have counterweighted vertical lift door with adjustable opening.
K models include Selective Power Modifier for input control to correct temperature lag.

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Electronic operated Veri-Tron indicating and controlling pyrometer, with thermocouple and lead wire $143.00
Same in self-contained, enclosed panel including line switch and fuses, with steel stand—completely wired 240.00
Steel stand with shelf 35.00

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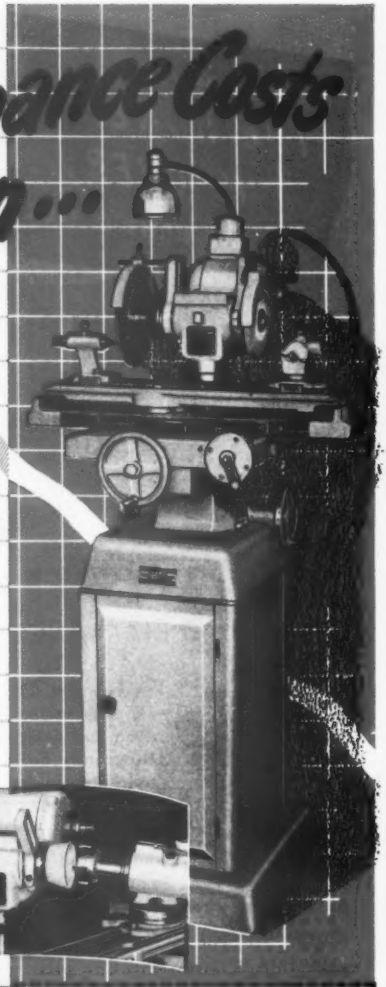
Tool Maintenance Costs Come Down...

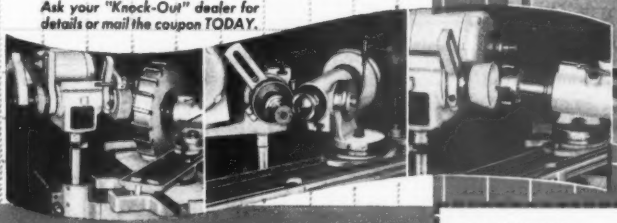
WHEN YOU USE A "KNOCK-OUT" Universal Cutter Grinder



Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lost between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A "Knock-Out" Universal Cutter Grinder is the busiest machine in any Tool Room.

Ask your "Knock-Out" dealer for details or mail the coupon TODAY.



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IS OVER...
and THE RENT IS DUE...

Lester - Phoenix Diecasting Machine Model HP 3½-x-SF. With pre-fill injection system.

LESTER FEATURES for the RECORD:

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- The unique "pre-fill" attachment which assures denser, tougher castings.
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• A year ago LESTER-PHOENIX announced a line of really *new* Diecasting Machines. And these machines—conceived and designed during the war years of yesterday—were deliberately built to meet your needs of today when reconversion has ended and the cry is again for production . . . full 24 hour, 350 day per year PRODUCTION.

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Write Today for LESTER information and a copy of the new booklet, STEEL FOR DIECASTING BLOCKS by L. James Erickson.

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TOOL & MFG Co.
GENERAL OFFICES

COMPLE
ENGINEE

- designers & builders of tools · jigs · fixtures · dies · gages · and special machinery ·
- process engineering ·
- product design · · ·
- plant layout & routing
- experimental and · · development engineering

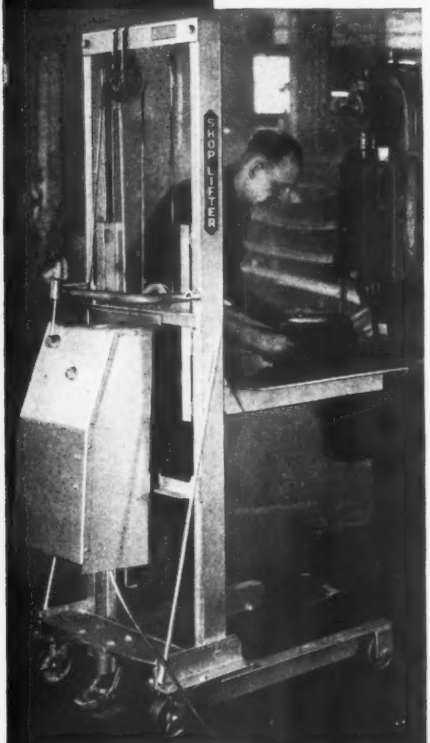
In response to increased demands for service, McKinney has increased its engineering staff and expanded its facilities for producing various kinds of tooling equipment and special machinery.

Write for bulletin illustrating and describing the McKinney exceptional facilities that are ready to serve you in various ways.

McKINNEY TOOL & MFG. CO. **CLEVELAND**
1673 Arabella Rd.

NOW the ELECTRIC SHOPLIFTER

Industry's favorite all-purpose lifter now powered for continuous duty service



The electric SHOPLIFTER has been engineered for those continuous duty jobs where a hand operated hoist is impractical or unduly tiring to the operator. To operate the lifter, plug the conductor cord into the nearest lamp socket, then turn the controller handle to the "up" or "down" position—that's all there is to it; the power unit does the lifting. Anyone can operate the electric SHOPLIFTER with perfect safety and without fatigue.

Motor—1/3 horsepower reversing type, built to NEMA specifications, 110 volt, single phase, 60 cycle AC, for lamp socket operation only. Platform speed—10 feet per minute.

Platform—steel plate, 24" x 24". Overall height—6'0". Platform lift—4'6".

Price—Complete machine, $397.50 f.o.b. Chicago with freight allowed. (Foot operated Floor Lock $10.00 extra). Hand operated SHOPLIFTER, $157.50.

Other Economy Lifting Machines of heavier capacities up to 5000 lbs. available.

PROMPT DELIVERY

Write for catalog.

2659 W. Van Buren St., Chicago 12, Ill.

ECONOMY ENGINEERING CO.

A New Catalog by MELIN Is Ready for *YOU*

Exclusive Maker of the Famous Bottom Cutting

3-FLUTE

(Spiral)

END MILLS

MELIN
TOOLS
END MILLS – COUNTER BORES – CENTER DRILLS – COUNTERSINKS
CORNER ROUNDING CUTTERS – DIE SINKING CUTTERS – ROUTER BITS

FEATURING:

END MILLS, 2-, 3- and 4-flute up to 2" dia.

COUNTERBORES

CENTERDRILLS

COUNTERSINKS

CORNER ROUNDING CUTTERS

DIE SINKING CUTTERS

ROUTER BITS

HOWARD RIGID-GRIP TOOL BIT HOLDERS

HOWARD LIVE CENTERS

★All Melin cutting tools are *high speed* tools, *triple drawn* for *long life.* All sizes are immediately available from stock.

Send for your copy TODAY.

MELIN ★ TOOL COMPANY, INC.

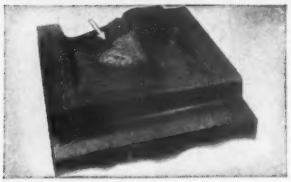
3370 West 140th Street, Cleveland 11, Ohio

1331 Phillips, S. W., Grand Rapids 7, Michigan

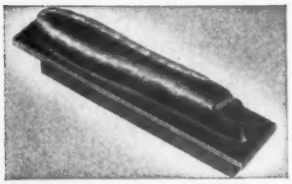
THE PIONEERS

of tool and die WELDING ELECTRODES

. . . can help you save 4 ways



Typical repair to Plow Share forging die with Eureka "Drawalloy" Electrodes.



Eureka Welding salvaged entire cutting area of Trimming Punch.

The use of Eureka Tool and Die Welding Electrodes can help you save man-hours, conserve valuable tools and dies and minimize production delays in 4 ways. 1. Repairing dies. 2. Composite fabrication. 3. Correcting design. 4. Rectifying errors.

Eliminate re-sinking operations by efficiently rebuilding defective forging dies with Eureka "Drawalloy" Electrodes. Weldments will match the characteristics of typical forging block steel! Welded and adjacent areas can be machined to the original dimensions of the die!

You can efficiently repair worn or discarded Tool-Steel Dies with Eureka's complete line of Tool-Steel Electrodes. Welded deposits will match the characteristics of Tool-Steels in their various classifications. The deposits are "hard-as-welded". Subsequent heat treatment unnecessary if the units lend themselves to grinding.

EUREKA TOOL STEEL ELECTRODES FIND THE SPOT

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

225 Leib Street • Detroit 7, Michigan

TODAY'S Keynote
PRODUCTION ECONOMY
TODAY'S answer
INVARO
These Invaro oil-hardening steel blanking dies are meeting a difficult requirement of close tolerance—held to .003 after heat treating . . . no tendency to shrink, warp or change dimensions. Uniform hardness and long life mean high production at low cost.
Look into INVARO for operations such as blanking, punching, forming, piercing, perforating, etc.
Call
Firth Sterling
STEEL & CARBIDE CORPORATION

With a Small Investment—

the SUNNEN
PRECISION HONING MACHINE
Will Accurately Finish All Internal Diameters from .125" to 2.625"

The wide range of sizes which the Sunnen Precision Honing Machine will handle makes it adaptable to thousands of jobs in production plants, tool and die shops, maintenance shops and salvage departments. Honing heads and stones are available to hone any kind of metal, plastic or ceramic material except lead and babbitt.

Accuracy is guaranteed to be within .0001" —and on such materials as hardened steel it has been held to .000025" on production jobs. Surface finishes can be produced to meet any commercial requirement.

The Sunnen Precision Honing Machine does not require skilled help. No jigs or fixtures are needed —it can be put to work immediately. Low in cost — economical to operate.

A Sunnen engineer will be glad to show you how you can apply Sunnen honing to your jobs, in your plant. Write for complete details. Ask for bulletin XSP5000.

SUNNEN

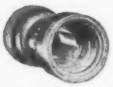
SUNNEN PRODUCTS COMPANY, 7947 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

194

Typical Examples

Miniature aircraft cylinder—smooth, accurate honing provides better compression and longer life.



Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

END MILLS FOR MODERN PRODUCTION
THE manufacture of modern machine tools requires the use of all types and sizes of end mills produced by Putnam. Conveniently located distributors maintain full stocks of these faster cutting, longer lasting end mills for immediate delivery to you. Call your Putnam Distributor today!
PUTNAM
TOOL COMPANY
2985 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

Higher Speeds Greater Power

Mall REG. U.S. PAT. OFF. COUNTER-SHAFT GRINDERS

Saves time and cuts costs on production finishing, routing, die sinking, and high speed filing of dies, patterns, tools castings and forging steels. Equally efficient on rough or delicate metals, pottery, porcelain, Bakelite, rubber or stone. Flexible shaft allows easier, more accurate manipulation of tool in precision work or general use as there is no motor weight and less gyroscopic force in operator's hands. ¾ H.P. motor has a range from 1650 to 7400 r.p.m. and develops nearly 3 times rated H.P. on overloads. The unit is available with overhead hanger mountings, swiveling round base mounting for table or bench or a stationary round base.

MALL Hand Cut Rotary Files are available for use on hard surfaces such as steel welds, high carbon steels, forging steels and glass molds. **Coarse, medium and fine cuts.**

MALL Mill Cut Rotary Files available for soft surfaces and metals such as solder, bronze, brass, copper, aluminum, etc. **Coarse, medium and fine cuts.**

Ask your Supplier or write FLEXIBLE SHAFT DIVISION for literature and prices.

MALL TOOL COMPANY

7724 South Chicago Avenue **Chicago 19, Illinois**

See Our Advertisement in *The Saturday Evening Post*—May 10 issue.

DESIGNED to eliminate the costly procedure of setting up the dies every time a job is repeated. "Standard" All-Steel Die Sets decrease set up time and lengthen tool life.

BUILT for the same long, productive service as the universally used "Standard" Power Presses.

Set up your dies only once — the first time — in a "Standard" All-Steel Die Set. Then they'll be ready every time the job is repeated. Used with any make of press — sizes to fit your needs. Prompt shipment offered on all catalog sizes. Write for catalog.

STANDARD MACHINERY COMPANY

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FEDERAL

"Go—no-go" shows only if off size

Dial Indicators show *how much*

USE DIAL INDICATORS FOR INSPECTING

ANGLE
CONCENTRICITY
DEPTH
HEIGHT
CURVATURE
LENGTH
INSIDE DIAMETER
LOCATION
THICKNESS
OUTSIDE DIAMETER
SQUARENESS
THREAD
WIDTH
AND COMBINATIONS
OF DIMENSIONS

THE BLIND SPOT

in old-fashioned gaging methods

THE conventional "go — no-go" gage serves only one purpose . . . it cuts down the passing of defective workpieces. The *modern* Dial Indicator method actually cuts inspection and production costs; improves the quality and quantity of production. With Federal Dial Indicators, you instantly *see how much* and *which way* each workpiece varies from its specifications. You know when and where production is tending to become unsatisfactory; you can adjust the machines *before* this happens. In addition, Dial Indicators are faster, positive and convenient for checking tools and gages, and in your laboratory.

THE CUSHIONED MOVEMENT — specially designed to withstand repeated shocks — can be had on all but the smaller sizes of Federal Dial Indicators. This shockproof mechanism has proved its merit under competitive conditions.

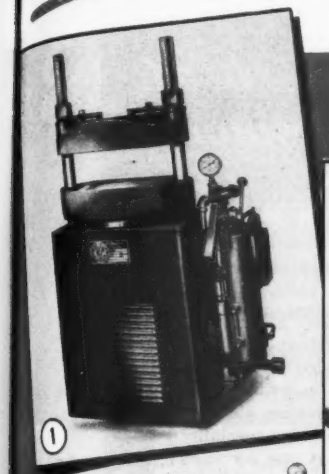
You can obtain practically any dial graduation or other physical requirement consistent with efficient Dial Indicator performance from Federal. Write us for illustrated Bulletin No. 37.

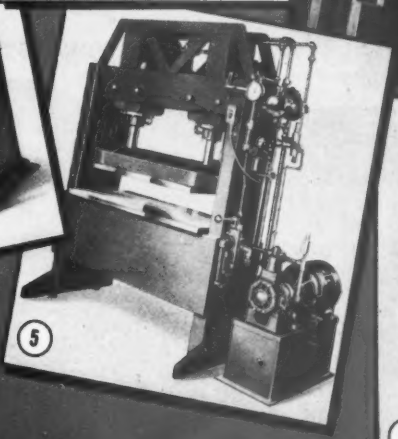
FEDERAL PRODUCTS CORPORATION
1144 Eddy St., Providence 1, R. I.

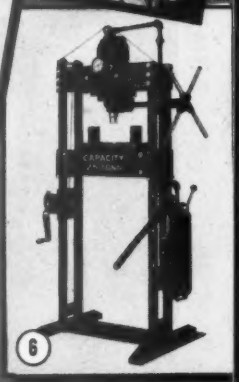
● Dimensional Dial Indicators and Indicating Gages—mechanical, electronic, air, multi-dimensional • Automatic Sorting • Dimensional Machine Control. Combinations of these methods.

NAME IT... AND YOU CAN HAVE IT!

KRW MAKES ALL KINDS OF HYDRAULIC PRESS ADAPTATIONS...TELL US WHAT YOU WANT, WE EITHER HAVE IT OR WE WILL MAKE IT







1. Plastic Molding Press. 2. Bending Press. 3. Stamping Press. 4. Horizontal Press. 5. Forming Press. 6. Motor-driven Arbor Press.

KRW Hydraulic Presses are available in tonnages ranging from 25 to 100-tons and either hand-operated, air-operated or motor-driven.

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BUFFALO 3, NEW YORK

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K. R. WILSON, 215 MAIN ST., BUFFALO 3, N. Y.

Please furnish information and prices on

Plastic Presses ☐ Bending Presses ☐ Stamping Presses ☐

Horizontal Presses ☐ Forming Presses ☐ Arbor Presses ☐

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Which Kind of Diamond Wheel is Best for Your Carbide Grinding?

NORTON Has 3 Types of Bond: Vitrified · Metal · Resinoid

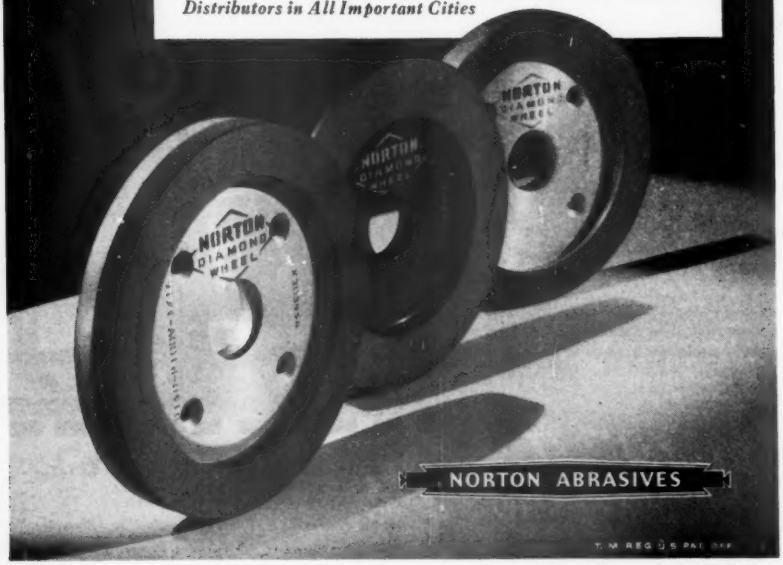
FROM the Norton line of diamond wheels you can select one with the right bond for every carbide grinding job—sharpening single point tools, grinding chip breakers, sharpening multi-blade cutters.

Norton has always been first in diamond wheels—with resinoid bonded in 1934, with metal bonded in 1939 and with vitrified bonded in 1944. There's a definite field for each of these three types. Your Norton abrasive engineer or your Norton distributor's abrasive specialist will be glad to help you select the right one for each of your carbide grinding jobs.

★

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Important Cities



Time-Tested Service-Proved

1917

30 YEARS

OF ENGINEERING "KNOW HOW" GUARANTEE THE PERFORMANCE OF

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multi-Purpose SHAPERS

They're FIRST for PRECISION...

They're FIRST for CUTTING PRODUCTION COSTS...

All three models of GEMCO Multi-Purpose Shapers...Plain, Production, and Universal types...incorporate important features in design that have been proved by 30 years of research, proved by actual tests in countless machine shops or suggested by operators from all parts of the country. These superiorities, resulting from the composite thinking of men who know, make GEMCO Shapers first for high performance, wide adaptability, maximum economy and lower production costs...and increased profits. Featuring in addition, GEMCO'S own exclusive LUBRIGARD, the safety device that prevents damage to the machine through any failure in the lubricating system, GEMCO Shapers give longer, trouble-free service. Complete and detailed description of the features found only in GEMCO Shapers are set forth in the Bulletins that are free to you for the asking.

• WITH EXCLUSIVE LUBRIGARD SAFETY SYSTEM

GENERAL ENGINEERING & MFG. CO.

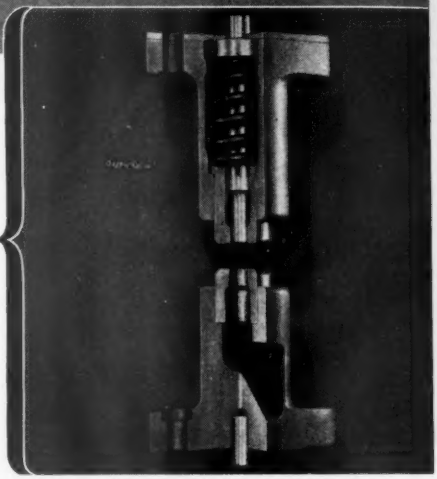
ST. LOUIS 16, MISSOURI

Nothing can be

WHAT ~~COULD~~ BE SIMPLER FOR HOLE PUNCHING THAN

THE **WALES** *PATENTED* AND EXCLUSIVE TEMPLATE

MOUNTING METHOD*



One Important Application is in Combination with

WALES
TYPE "CD" HOLE PUNCHING UNITS

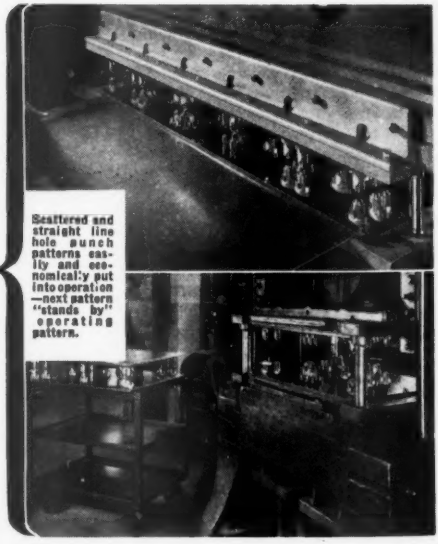
Wales Template Mounting Method is the ultimate in simplicity. Various Units are set up on templates outside the press. These template sets are then mounted in a die set which remains in the press. Just insert one pair of templates for each part. Then remove after job is run and insert another pair. **Press "down time" is only a matter of minutes.**

Above: Quarter-section view of Wales Type "CD" Hole Punching Unit showing relationship of parts of the self-contained punch assembly and die assembly.

AVAILABLE IN 2 WAYS:

EITHER you make the entire setup with Wales Units and assume all responsibility for proper mounting—

OR complete setup will be made at Wales-Strippit factory backed by a 100% guarantee.



Scattered and straight line hole punch patterns easily and economically put into operation—next pattern "stands by" operating pattern.

IMPORTANT NOTICE: More and more users are deciding that these punch and die units should not be removed from their mounting plates until the part becomes obsolete. Why waste time and pay money out in unnecessarily moving units from plate to plate when the setup, after once being made, may better remain intact and eliminate the SETUP DRAIN on your operating costs. However, if it is quick rearrangement of standard units you want, nothing can be simpler than using the Wales patented units and mounting methods.

***Note: The Wales-Strippit Corporation has not granted permission to anyone to use this patented mounting method except with Wales Hole Punching and Notching Equipment.**

SAME GROUP OF UNITS USED IN STAMPING PRESSES AND PRESS BRAKES

It's too big a story to tell on this page so write for fully illustrated, functionally-colored Catalog CD.

WALES-STRIPPIT CORP.

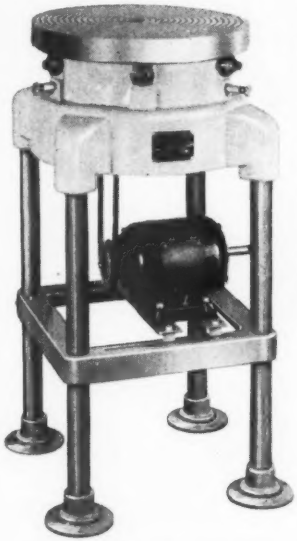
GEORGE F. WALES, *President*

Specialists in Punching and Notching Equipment

355 PAYNE AVENUE
N. TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD.
Hamilton, Ontario

MIRROR-FINISH HIGH SPEED
LAPPING
with *Spitfire* Precision Lapping Machines



A low cost method of obtaining the finest and most accurate micro-inch surface finishes on such parts as bearings, shafts, hydraulic and pneumatic equipment, valves, sliding or rotating surfaces, seals and parts of precision equipment, tools and gauges. An ordinarily expensive, laborious operation has been turned into an easy and economical production process with the SPITFIRE LAPPING MACHINES.

No set-ups, collets, centers or holders are ordinarily needed, yet these machines can be readily adapted by means of simple, low cost fixtures to the automatic and fine surface finishing of high runs of parts at very low production cost. This enables the manufacturer to obtain that fine finish necessary for close fit, smooth, vibrationless and wear-proof performance. The result is better product performance—satisfied customers—a quality product reputation invaluable in the competitive sales period ahead.

WRITE TODAY for our detailed circulars, prices and delivery.

The SPITFIRE PRECISION FLAT LAPPING MACHINE

Produces the finest micro-inch surface finishes, flatness and accurate size on flat surfaces of metals or other materials. Operator merely holds piece in hands and manipulates it on rotating lapping plate. The heavy work of lapping is done by the machine. Amount of stock removal and fineness of finish can be varied by selection of proper abrasive.

The SPITFIRE ROLLER LAPPING MACHINE

Has replaced "ring" and other old-fashioned methods of lapping external cylindrical surfaces in many of the country's finest and largest toolrooms and manufacturing plants.

It finishes any size cylindrical pieces up to 6" Dia. to plug gauge accuracy and micro-inch finish. This centerless lapping machine tends to remove "waves" or "high spots" along the length of the pieces. Parts can be removed and examined or measured while the machine is running.

Spitfire TOOLS, INC.

2931 N. PULASKI RD., CHICAGO 41, ILL.

METAL Stampings DUPLICATED WITHOUT DIES

With DI-ACRO Precision Machines

If you desire to save time and die expense on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

SHEARS

Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width—Shear No. 1—6". Shear No. 2—9". Shear No. 3—12".

BRAKES

Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No.2—12". Brake No. 3—18".

BENDERS

Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity—Bender No. 1—$\frac{1}{8}$" round cold rolled steel bar. Bender No. 2 and No. 3—$\frac{1}{2}$" cold rolled steel bar.

Send for Catalog "DIE-LESS DUPLICATING"

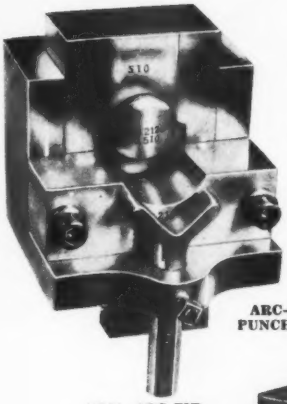
It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING ← Pronounced "DIE-ACK-RO"

O'NEIL-IRWIN MFG. CO. 315 Eighth Ave. Lake City, Minnesota

Introducing ARC•FIT

THE TUBE AND PIPE NOTCHING PRODUCTION TOOL



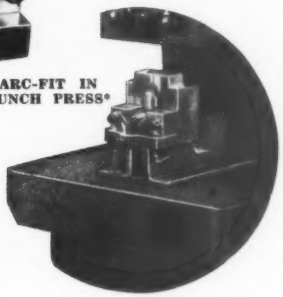
THE ARC-FIT UNIT COMPLETE*

The development of the new ARC-FIT makes it possible to use a hand or power press for notching the ends of tubing or pipe for welded or brazed joints.

ARC-FIT is adaptable to any standard hand or power press. A hand press specifically designed for ARC-FIT can be supplied.

ARC-FIT performs notching and cutting operations for pipe and tubing "T" or angular joints.

By modern ARC-FIT, *five seconds* is required—compared to 10 or 20 minutes by antiquated burning, sawing, grinding, or milling methods.

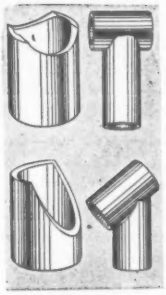


ARC-FIT IN PUNCH PRESS*

IMPORTANT COST SAVINGS!

STEPS UP PRODUCTION!

← ARC-FIT IN HAND PRESS*



TYPICAL ARC-FIT CUTS →

Notable features of ARC-FIT include:

- A sturdy precision tool
- For any size pipe or tube
- Usable with hand or power press
- No rejects even with unskilled operators
- Finish grinding or filing unnecessary
- No deformation of pipe or tube
- Possible Product Design changes at lower cost
- Quick punch and die interchanges in one housing
- Shears from inside of the pipe or tube
- Punches and Dies easily interchangeable in same housing
- Can be used as portable unit
- Precision produced to insure cutting accuracy

Prices for "T" Joints. ARC-FIT complete with housing, punch and die for one size—¼" up to 2" inclusive.		
Standard Pipe	$110.00	Prices on individual punch and dies and on larger units quoted on request.
Tubing	130.00	
Hand Press	80.00	F. O. B. CHICAGO

*PATENTED

Manufactured Exclusively by

VOGEL TOOL AND DIE CORPORATION

2527 MOFFAT STREET • CHICAGO 47, ILLINOIS • DEPT. TJ

OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED •

FOR BETTER INDUSTRIAL SHARPENING

BENCH STONES

BY NORTON ABRASIVES

Oilstones are supposed to be used with oil. Oil makes them cut faster and cooler and produces a better cutting edge. Oil helps them resist glazing and filling.

But oil-filling is a messy job at best — and it has to be done right. The oil must penetrate the pores of the entire stone. And, unless the right kind of oil is used, the surface of the stone will "gum."

Factory oil-filling is just another little extra quality feature of Crystolon and India Bench Stones. The whole job is neatly done at the Norton-Pike factory so these famous stones are oil-filled when you get them.

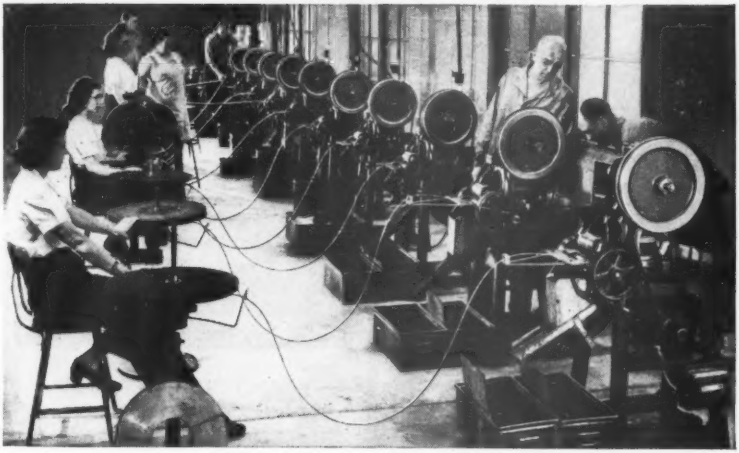
Specify Crystolon for silicon carbide abrasive, or India for aluminum oxide — they're both oil-filled for your convenience — and for better sharpening. Write for your copy of "How to Sharpen."

BEHR-MANNING · TROY, N. Y.
(DIVISION OF NORTON COMPANY)
ALSO QUALITY COATED ABRASIVES SINCE 1872

OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED •

PRODUCTION PLUS!

OVER a million stampings per day with this battery of DIEBEL Hi-Speed 550 R.P.M. AUTOMATIC PRESSES



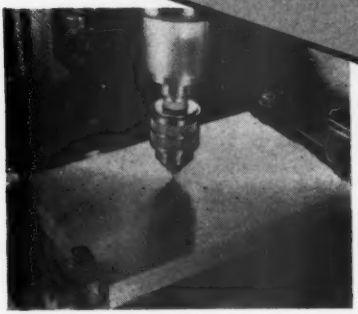
THESE 10 PRESSES OCCUPY ONLY 12 FT. x 45 FT.

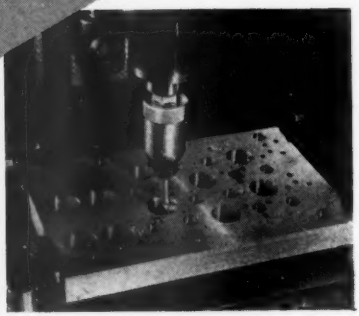
The speed of this automatic press—it's adjustable up to 550 strokes per minute!—has resulted in soaring production records over a period of years in hundreds of plants. Diebel Hi-Speed Automatic Presses, like those above, have performed wonders on steel, brass, phosphor-bronze, fiber, plastics, rubber and paper.

May we send you our illustrated circular? It's yours for the asking—an introduction to the solution of your light blanking and forming problems.

DI MACHINE CORP.
DIVISION OF DIEBEL DIE & MFG. CO.
2713 West Irving Park Road Chicago 18, Illinois

HOW TO OBTAIN *increased speed* AND *closer tolerances* IN JIG BORING





NO S-T-O-P and S-T-A-R-T TO CHANGE TOOLS AT EACH HOLE

In the Moore Jig Borer you can *consecutively* spot, drill, bore and ream *all* holes in the work-piece with minimum tool changes. In other words, you don't have to change tools at individual holes for each operation, because there are no size blocks or end measures to labor over.

Accurate lead screws *built into* the Moore Jig Borer enable you to make table settings faster than you can change tools. A glance at your blueprint—a few turns of the micrometer dials and the work is set to precise location. Moore lead screws, accurate to .0002" over 14" of travel and .00005" in any given inch see to that. Another advantage—you make each setting three times, enabling you to quickly notice and correct any errors you may have made.

The Moore Jig Borer is ideally suited for jigs, fixtures, dies, special machine parts and jig-less, small-lot production. It is highly sensitive for holes 1/32" diameter, yet rugged for heavy cuts up to 4½".

RAPID TABLE SETTINGS PROMOTE GREATER ACCURACY IN FINISH BORING

Rapid table settings on the Moore Jig Borer encourage operators to follow the best toolroom practice—roughing *all* holes before finish-boring *any* of them.

Moore lead screws are so fast to set—faster than tool changes—that it *pays* to pre-rough all holes. Temperature changes or stresses caused by roughing cuts *cannot* interfere with finish-boring.

After roughing, the set-up can be easily checked and re-set before taking any finish cuts.

All finish-boring is completed without stressing or heating of the work-piece. These favorable conditions, maintained throughout the entire finish-boring operation, on the Moore Jig Borer, are further assurance of ultimate accuracy in the completed work.

Write today for descriptive literature

MOORE JIG BORER

MOORE SPECIAL TOOL CO., INC., 726 UNION AVE., BRIDGEPORT 7, CONN.

GET THE FACTS

ON *American's* UNIVERSAL BROACHING MACHINE

AMERICAN
TYPE-T
3-WAY
BROACHING
MACHINE
American heavy vertical hydraulic broaching machines are general purpose machines adaptable to many different operations including surface broaching as well as push down and pull down internal broaching. Easily operated. Easily equipped. Highly productive and flexible in its applications. Sizes range from 4 to 8 tons with 24" stroke and 6 to 14 tons with 36" stroke.

A NEW CIRCULAR, just off the press, tells the story of *American's* highly flexible 3-way Broaching Machine. Shown in detail are the various kinds of work it performs, including surface broaching, and push down or pull down internal broaching. *American* 3-way Vertical Hydraulic Broaching Machines combine the advantages of fast, easy operation with the ability to maintain a high rate of accurate production. A letter or post card will bring the new circular by return mail. Write today. Ask for Circular Number 100.

MEMBER BROACHING TOOL INSTITUTE

American
BROACH AND MACHINE CO.

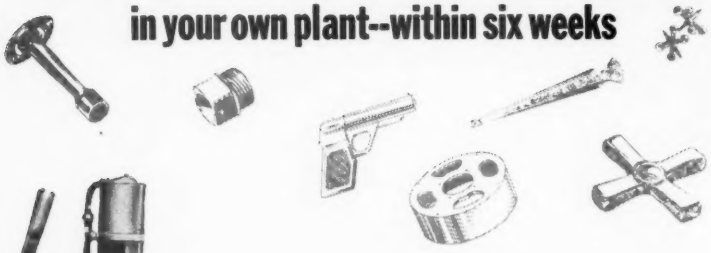
ANN ARBOR, MICHIGAN

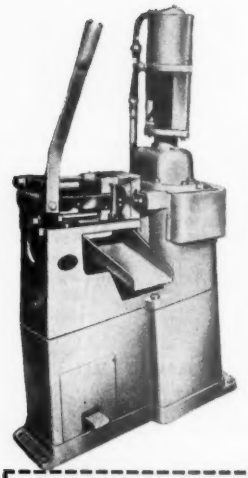
•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF

DIE CAST SMALL PARTS
600 to 900 shots per hour
with a DCMT Die Casting Machine
in your own plant--within six weeks





LOW INITIAL COST

At last every plant – large or small – can enjoy the advantages of on-the-spot pressure die casting. With a DCMT Die Casting Machine – which costs less than a small engine lathe and can be operated by unskilled personnel—you can be in operation in as little as six weeks producing your own small parts at high speed – economically.

ELIMINATES HIGH COST FINISHING AND MACHINING

Hundreds of manufacturers who solved the problems of material shortage and expensive finishing and machining operations with a DCMT machine, have discovered that they are producing parts at a greatly reduced unit cost as well. Why not let a simple, low-cost DCMT Die Caster work similar wonders in *your* plant? *For a demonstration of this unusual machine in actual operation in your area, mail the coupon below.* Complete information about on-the-spot pressure die casting will be found in our new catalog.

DCMT Sales Corporation
Division of British Industries Corp.,
Dept. L4, 315 Broadway, New York 7, N. Y.

DCMT Sales Corporation, Dept. L4
315 Broadway, New York 7, N. Y.

☐ *Please arrange for me to see a DCMT Die Casting Machine in operation in my locality, without obligation.*

☐ *Send me a copy of the new DCMT Catalog.*

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Firm.....

Address.....

City.....Zone.....State.....

DCMT

DIE CASTING MACHINE

tired of the **Old Grind?**

We'll take it over

Grinding is our business. We have the equipment (see list at right) and the skilled manpower for *any* kind of grinding . . .

From the simplest surface grinding to the most intricate form grinding . . . from relatively easy tolerances to tenths or less, if necessary . . . from one piece to large quantities . . . at lowest prices possible for the accuracy you require.

Send us your prints for firm quotations and dependable delivery commitments to any point in the United States.

GRINDING DEPARTMENT EQUIPMENT

12—Surface Grinders
1—No. 11 Blanchard Grinder
1—No. 22 Heald Rotary Grinder
4—Internal Grinders
4—External Grinders
3—36"J & L Optical Comparators
2—Toolmakers Microscopes
42—Sets of Gage Blocks (81 blocks per set) providing one set for each Grinder Hand and Gagemaker

Remainder of our shop is equally well equipped and provides facilities for supplying all of your requirements on tools, gages, special machines or precision components.

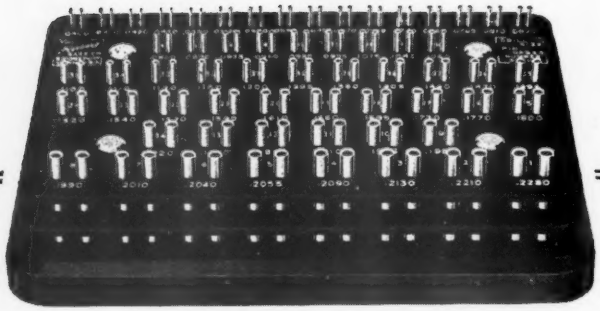
BUILDERS OF PRECISION TOOLS GAGES • • JIGS • • FIXTURES

TOOLS *and* GAGES

INCORPORATED

3112 EAST 63rd STREET • CLEVELAND 4, OHIO

MICHIGAN 7230



DRILL SIZE PIN GAGES

Class Z Accuracy

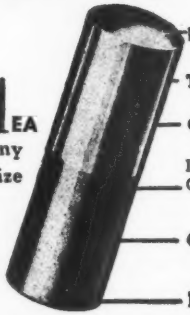
LETTER SET—52 gages in 26 pairs from A to Z. $45 set.

FRACTION SET—60 gages in 30 pairs in steps of 1/64" from 3/64" to 1/2". $50 set.

NUMBER SET — 120 gages in 60 pairs from 1 to 60. $90 set.

All sets include stands ... Prices F.O.B. Bridgeport, Conn.

$1 EA any size



- Polished Radius Top
- TOLERANCE +.0001 —.0000
- Overall Length 1½"
- LOWER HALF CONCENTRIC TAPERED for easy insertion
- Oil Hardened Tool Steel
- Flat Ground Bottom

Sets in pairs of gages for checking any number of similar holes. Stands have 3 plates and cover so that gages stand upright. Drill size is plainly stamped in front of each gage hole, together with decimal equivalent to the ten thousandth of an inch.

IMMEDIATE DELIVERY — 116 SIZES

Check or M.O. should include .08c postage for quantities less than Set. Sets shipped Express Collect. No C.O.D.'s.

THE *Horberg* GAGE COMPANY

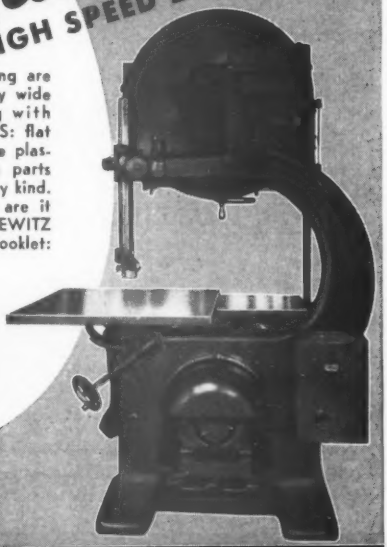
19 STAPLES STREET, BRIDGEPORT 1, CONN.

for Sawing **METAL** *as* **HARD** *as a* **FILE**
or Trimming **FORMED PARTS**
- FAST!

Actual photo of file friction sawn on Tannewitz High Speed Band Saw.

Tannewitz
HIGH SPEED BAND SAWS

Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet: "FRICTION SAWING."



THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

Empco JACKS

. . . just a twist of the wrist and your machines are LEVELED!

To lower, turn screw to left.
To raise, turn screw to right.

SELF-ALIGNING
SMOOTH, ACCURATE, POSITIVE ADJUSTMENTS!

Machine Tool Manufacturers strongly emphasize the need, not only to set machines level, but to keep 'em that way. Periodic re-leveling is essential for accurate work tolerances. How often, depends on the type of foundation. No method of machine setting is stable enough to maintain the accuracy of initial leveling. It is important to check after first month of operation, then check periodically and re-level whenever necessary.

When a machine is set on EMPCO JACKS, the whole operation is the work of but a moment: Simply apply a wrench to the "hex" screw head, turn right or left until your level indicator reads "zero."

AVAILABLE in 3 SIZES

No. 1
2″ normal height

No. 2
2⅜″ normal height

No. 3
3⅛″ normal height

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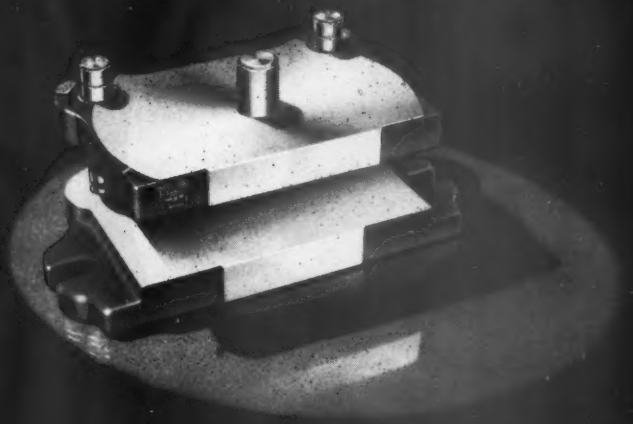
THE ENTERPRISE MACHINE PARTS CORPORATION

2735 JEROME AVE. DETROIT 12, MICH.

Die Sets for Every Stamping Job



Our constant endeavor to deliver a better product is the basis of our ever-increasing volume of business. We invite your inquiries regarding all-steel and semi-steel, standard and special die sets; dowel pins, cap screws, die springs and other accessories.

CALL "DETROIT"

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PORTLAND, ORE.	AT 1466
SAN FRANCISCO	EX 7018
BUFFALO	PA 9806
PHILADELPHIA	VI 4-4084
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LOS ANGELES	AD 7851
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DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★

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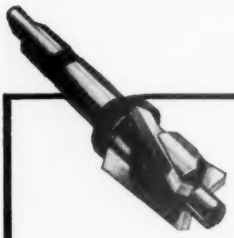
ADJUSTABLE HOLLOW MILLS



There is a Genesee for every hollow milling job. Available in 16 styles. Standard sizes from 0 to 2", with straight or Morse taper shanks carried in stock . . .

- Each size tool has 1/8 range.
- Blades quickly ground in a simple fixture.
- All tools manufactured of heat-treated alloy steel.
- Adjusting threads are ground from the solid and adjusting rings are lapped for extreme accuracy.
- Furnished with high speed steel, cast-alloy, or Tungsten Carbide tipped blades.

Let our Engineering Department solve your Production Tool problems.

Other Genesee tools that will increase production.

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Inserted Blade
FACING AND
COUNTERBORING
TOOLS

•

SPECIAL PRODUCTION
TOOLS

Write for catalog 45-J

GENESEE MFG. CO., INC.
GENESEE
EST 1908
ROCHESTER 4, N.Y.

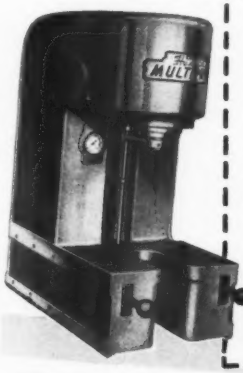
ADJUSTABLE HOLLOW MILLS • FACING AND
COUNTERBORING TOOLS • SPECIAL PRODUCTION TOOLS

Operator's View of MULTIPRESS Efficiency

Assembling Contact Points on Mallory Vibrator Bases

Here's how *the Mallory Company*, in Indianapolis, uses **MULTIPRESS**, equipped with a HydrOILic Indexing Table, for quick, easy assembly of contact points on vibrator bases. This is typical of hundreds of jobs being handled by **MULTIPRESS** at speeds limited only by the operator's ability.

Below: 4-Ton Basic Unit



In fact, on any type of operation calling for *controlled pressure*, the revolutionary, bench-size **MULTIPRESS** offers such obvious advantages as—

—infinitely variable working pressures you can preset to the exact needs of any task . . .
—quick, easy, stepless adjustment of ram speed and stroke length . . .
—extremely compact design that minimizes space problems . . .
—manual and automatic controls for almost any type of ram action . . .
—a wide range of *standard* toolings and accessories for countless "special" operations.

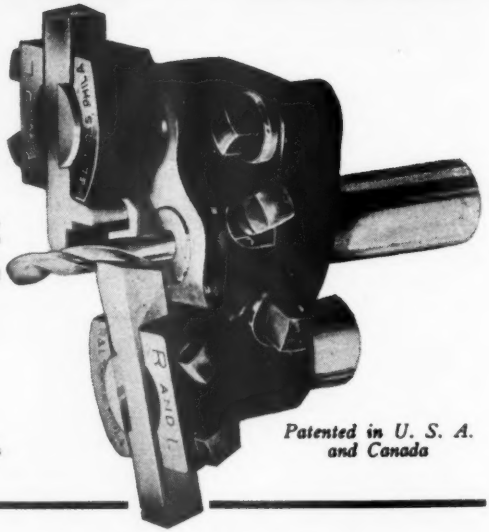
From users in almost every industry known, we get convincing—and sometimes astonishing—proof that these and other **MULTIPRESS** features bring lower costs, increased production, and better products. **MULTIPRESS** is available in 4, 6, and 8-ton capacities. Send for details.

THE **DENISON** ENGINEERING CO.
1197 DUBLIN ROAD, COLUMBUS, 16, OHIO

DENISON EQUIPMENT for APPLIED HydrOILics

1=14 @ 1/4 The Cost

When The Tool Is an R and L Combination Turning Tool



One R and L Combination Turning Tool, the only combination right hand and left hand tool on the market, actually does the work of 14 tools.

You can use an R and L for all these right hand or left hand applications:

- Roller Box Tool
- Centering and Facing Tool
- Knee Tool
- Pointing Tool
- Back Rest
- Floating Drill Holder
- Balanced Turning Tool

The change from right to left or vice versa takes only ten seconds.

Patented in U. S. A. and Canada

√ *CHECK THESE OUTSTANDING FEATURES*

- **Made of extra tough, heat treated alloy steel, unconditionally guaranteed not to bend or give way.**
- **Essential parts ground to extreme accuracy affording perfect alignment at any point of adjustment.**
- **Back Rests, or burnishers, have almost diamond hard surfaces eliminating metal pick-up and marring of work surface.**
- **Interchangeable Roller Back Rests furnished if desired.**
- **Precise adjustment on both cutting tool and pressure of burnishers.**
- **Tool bits wear longer because they are ground only on top side, or end.**
- **Less cross-slide clearance required, saves times and often permits working with cross-slide tools while turning or drilling.**
- **On turnings, the R and L Combination Tool produces highly polished surfaces, true to size, and straight.**
- **Usable either for roughing or finishing; extra heavy cuts possible because thrust is always in direct line with Back Rest.**
- **Longitudinal adjustment permits turning of two diameters to any length within tool capacity.**

All these and many other features are shown by photographs and drawings in descriptive booklet mailed without cost or obligation. The booklet illustrates the tool set-up for various operations, and indicates speed and simplicity of its adaptation to various jobs. Prices and full specifications of many available sizes are included. Write for your copy today.

R and L TOOLS *1825 Bristol St., Philadelphia 40, Pa.*

SPRINGFIELD PRECISION TOOL ROOM LATHE

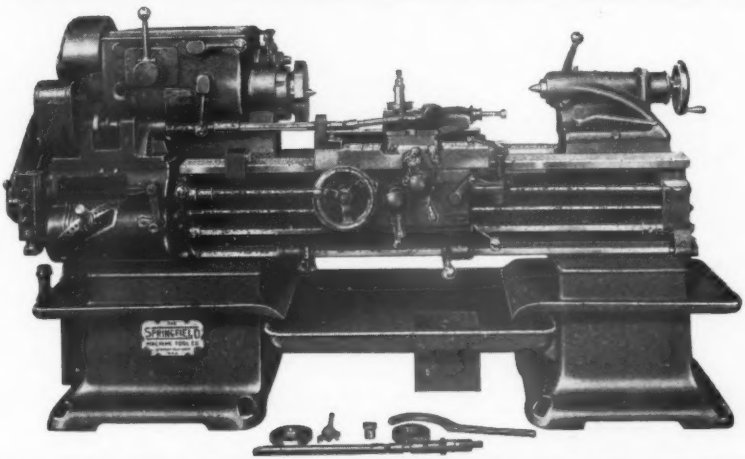
"A Master Lathe for Master Craftsmen"

The Springfield Precision Tool Room Lathe is engineered and constructed to the most exacting requirements. Its superior design features have been developed through more than sixty years' experience in building precision machine tools.

The powerful Headstock provides twelve spindle speeds. No more than seven of its chrome Molybdenum hardened *ground* gears are in mesh at one time. Timken Precision Taper Roller Bearings in solid headstock housings insure permanency of spindle alignment and long life. All bearings and gears are spray lubricated by cooled oil from the large reservoir in the leg.

The semi-steel Apron is of extra-heavy, box construction and is completely ball and bronze bearing-equipped. The Taper Attachment is capable of very fine, micrometer screw adjustment. The sturdy Compound Rest is a heavy duty, square base type providing full 360° swivel. The Tailstock, massively designed, has large centers and exceptionally long spindle travel.

ASK US FOR *YOUR* COPY OF BULLETIN 162 which illustrates and describes the features of the Springfield Precision Tool Room Lathe and gives detailed specifications.



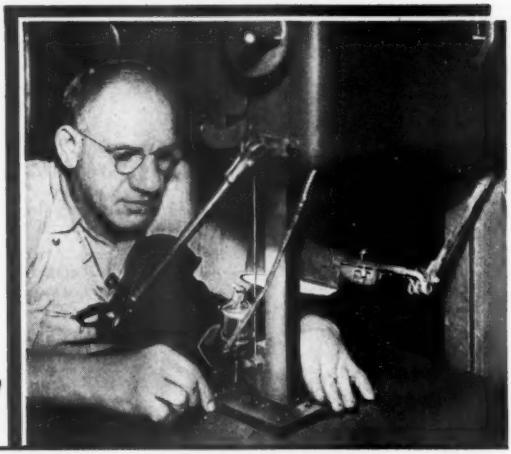
THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

Specify ATLANTIC

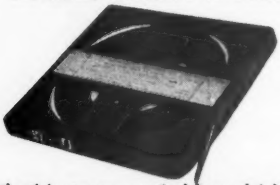
BAND SAW BLADES

for Smoother



CONTOUR CUTTING

ATLANTIC SAWS meet all of your requirements for a superior blade on complicated die and fixture radius cutting. ATLANTIC specializes in accurate milled and precision set teeth, hardened to exact temper.



Atlantic's strong, practical box, plainly marked on sides and top. Remains in good condition until entire coil is used.

ATLANTIC'S special alloy steel insures longer wear and easier welding.

ATLANTIC'S one temper saw for all metals reduces stock you have to carry. Cut to length and welded, ready for use. Packed in strong Atlantic box. Write for new Atlantic Catalog.

Atlantic Saw Mfg. Co.

INCORPORATED

Exclusively Manufacturers of Band Saw Blades

160 Brewery St., New Haven, Conn.

SOCKET HEAD CAP SCREWS

In tooling jigs and fixtures "ALLENS" are the universal screws, either for powerful clamp set-ups or fine, precise adjustments. Their strength of head and accuracy of thread are achieved by Allen *pressure processes* that eliminate weaknesses caused by cutting the stock.

The above view was taken in the toolroom of Douglas Aircraft Company, Santa Monica, Calif. In small tooling jigs like the one above and equally in the heaviest welding fixtures, "Allens" have the *clamping-power* to depend on! Threads are accurate to a high Class 3 fit, for a maximum of frictional holding-power in the tapped hole. Internally engaging hexagon keys are obviously the handiest of wrenches for this work. Ask your local Allen Distributor for samples or demonstration.

THE ALLEN MANUFACTURING COMPANY
HARTFORD 1, ★ ALLEN ★ CONNECTICUT, U. S. A.

BIG
JOBS TOO

VERSATILITY is always at a premium in toolrooms. Heavy jobs, intricate work, awkward shapes, and the multiplicity of operations all challenge the versatility of toolmakers and their tools.

It is their versatility that makes South Bend Lathes so popular in toolrooms—their capacity for accurately machining anything from tiny instrument parts to heavy jobs like the one shown—plus their ability to perform efficiently a wide variety of machining operations. All of which means that you get more toolroom work done in less time with South Bend Lathes.

Write for a copy of Catalog 100-F which describes all sizes and types of South Bend Lathes, attachments, and accessories.

Machining a planer drive shaft on a 16" x 12' South Bend Lathe.

Building Better Lathes Since 1906

SOUTH BEND LATHE WORKS

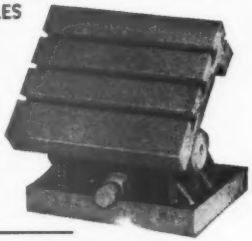
432 EAST MADISON STREET • SOUTH BEND 22, INDIANA

TOOLS *for* PRECISION PRODUCTION

ADJUSTABLE ANGLE PLATES

MODEL "A"

FOR MACHINING AND GRINDING ANGLES



These Angle Plates are made of the best grade of gray iron, machined and ground true with the holes, all steel parts are hardened and ground.

MODEL "A" has four $\frac{3}{16}$" "T" SLOTS, 3 on the face side and one "T" Slot on the top when set at 90°. The size of this plate is 3 x 3 x 3¾. Shipping weight 5 lbs.

NET PRICE **$16.85**

DRILL JIG BUSHINGS

A. S. A. STANDARD

- SLIP RENEWABLE
- FIXED RENEWABLE
- LINERS
- HEADLESS PRESS FIT
- HEAD PRESS FIT
- HEAD TYPE LINERS

SIMPLIFIED ORDERING

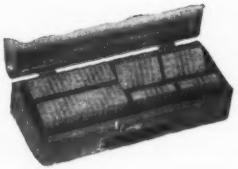
Specify drill size, O. D., and length in order named. Also bushing number. Bushings above 1¾" hole size will be quoted upon request. In ordering special bushings, forward blueprint showing all dimensions and limit.

These Drill Jig Bushings are made of high grade tool steel—Rockwell C 62 and 64 hardness.

*Special length bushings carried in stock in blank form.

MAGNETIC BLOCKS

FOR SURFACE GRINDERS



This universal set consists of two parallels 1" x 1¾" x 3¾", and two V-blocks 1¾" x 2⅜" x 1⅞". This set has been especially designed for holding various types of work that cannot be placed directly on the magnetic chuck. Complete in Hardwood Case.

$17.50 SET

PROMPT DELIVERY

Write for Literature

PRECISION PRODUCTION TOOLS

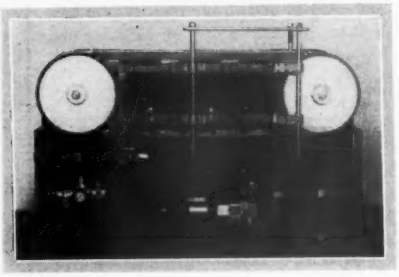
ACME TOOL COMPANY

96 WARREN STREET • NEW YORK 7, N. Y.

NEW Automatic MACHINE

TESTS Condenser COILS

Trap doors spring open at any one of four testing stations on this conveyor-type automatic testing machine, sorting and rejecting defective coils in an uninterrupted operation.



Barth-designed coil testing machine built to save manhours and up production

HOW TO test condenser coils for electrical flaws . . . automatically reject faulty coils at high speed . . . was the problem put to Barth engineers. The difficulty was acute, for the operation had to be continuous and accurate in detecting (1) over potential, (2) under potential, (3) grounded, and (4) capacity variance in the condensers.

BARTH ENGINEERS found the answer in the machine pictured above, designed and built by Barth for a large electrical manufacturer. Entirely automatic, this air-operated machine tests the coils, drops out rejects, passes perfect units in a steady flow . . . ups production sharply.

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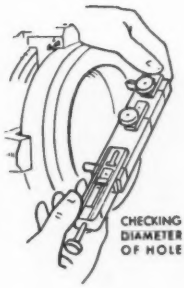

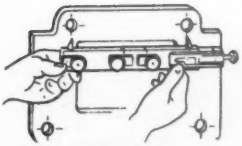

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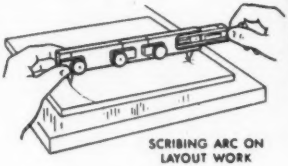

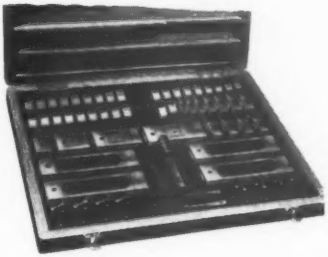

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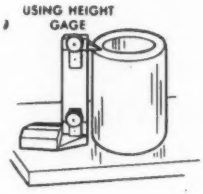

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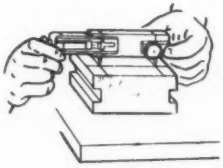

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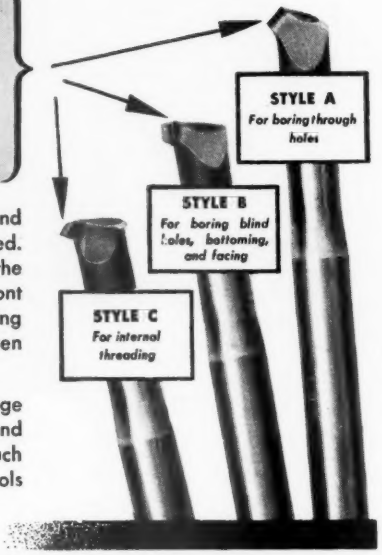

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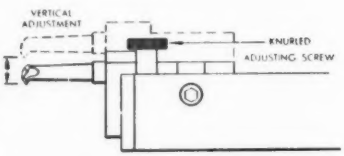

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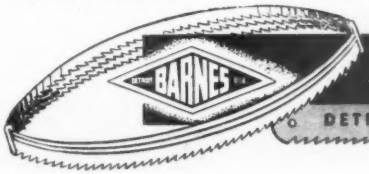

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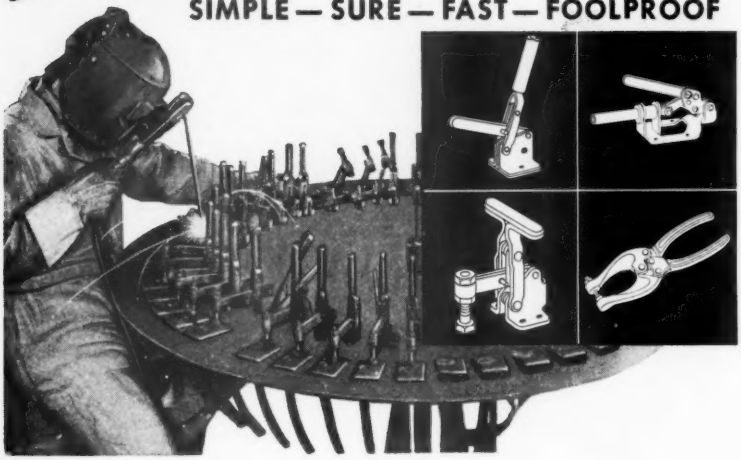

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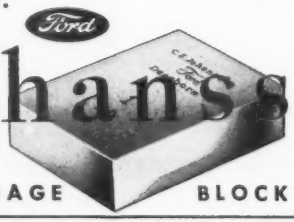

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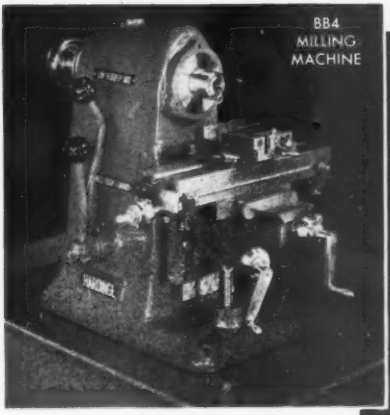

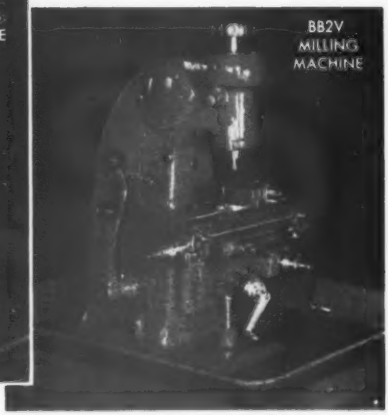

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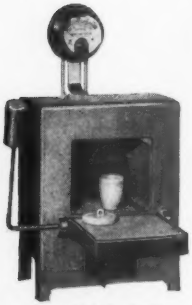
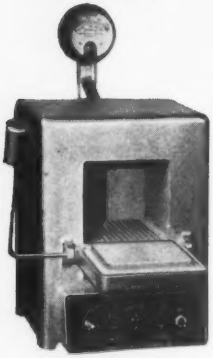
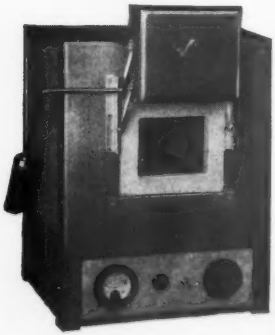


MODEL GTP



MODEL CEA



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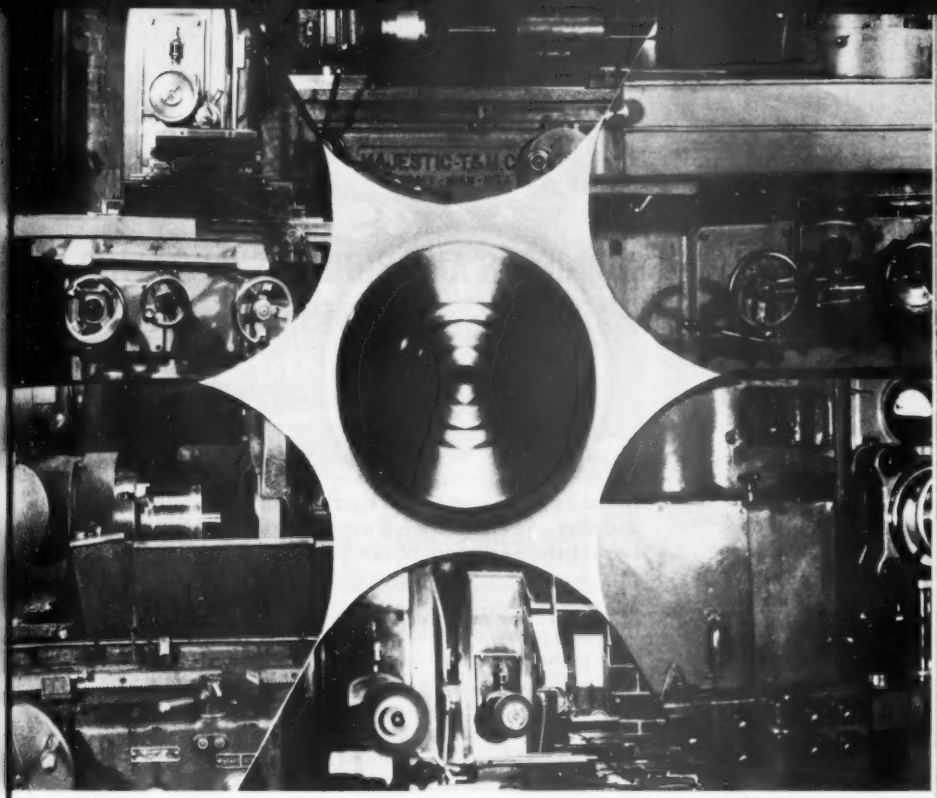

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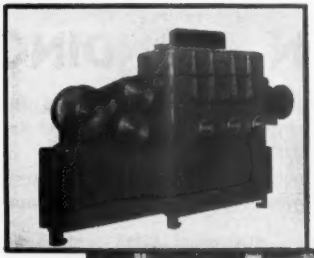

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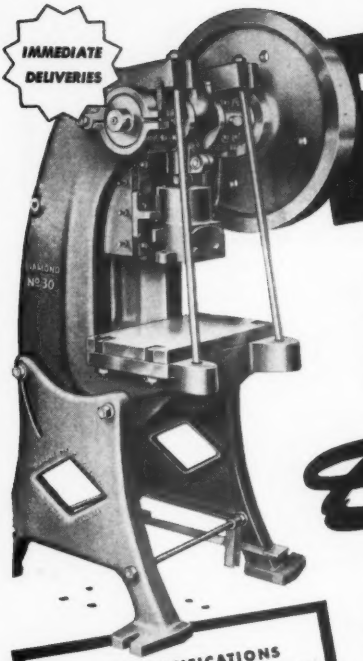

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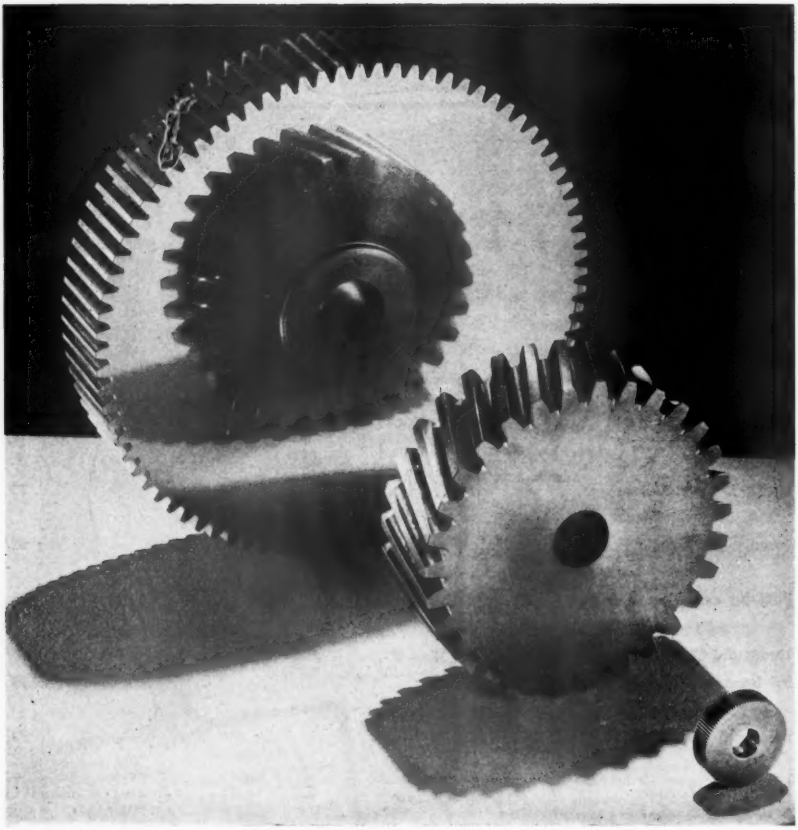

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production costs and craftsmanship

The design and use of more, as well as more intricate, production tooling has tended toward reducing operating skill requirements. Economic justification for the newer and more specialized tooling, for which the tool users look to and are dependent upon the tool makers, is beyond question and comes under the heading of production costs. Prevailing high material costs and trends toward higher labor rates mean that a competing manufacturer must employ every constructive means possible to reduce unit costs in order to survive. Excessive costs = no profits = no manufacturer = no jobs; it's just that basic.

An important subdivision of production costs is employer-employee relations. There is increasing evidence that management is taking cognizance of improvements that can be effected in these relations simply by recognizing the American worker's inherent, but too often dormant, pride in craftsmanship; dormant because of lack of outlet.

One large concern experienced an eye-opener in this respect. The screw machine operators expressed dissatisfaction with the robot-like monotony of their jobs; after years of operating experience they were not enjoying that sense of accomplishment that results from employing higher skills and which both relieves monotony and satisfies pride in craftsmanship. Therefore, why couldn't they make, and be responsible for, their own setups?

They made the sale. An understanding management provided the ways and means. Result? Higher-skilled workers enjoying a greater sense of responsibility for their output, higher pay, higher production, and improved employer-employee relations. Cost? An investment of 50% employee initiative and 50% employer open-mindedness paid dividends.

Similar mutual gains are evident as the principles and practices of Quality Control become everyday production and assembly line functions. As production and assembly workers are trained in, and become adept at, applying Quality Control techniques to their jobs, that intangible but antagonistic barrier between them and Inspection fades away. Inspection, instead of being accepted as a necessary evil denoting rejections, reductions, repeats and recriminations, has become the heretofore missing link in production. Quality Control, i.e., Inspection retooled, is paying off in higher skills, higher pay, higher and less wasteful production, improved product and, most important, higher morale and improved employer-employee relations. Again, better craftsmanship, lower production costs.

Our editorial last month dealt with transfer machining which is in nowise inconsistent with the premise that production costs are lowered as craftsmanship is raised. If an intricate transfer machine "production line" can be considered a highly mechanized, automatic production department, the operator of that machine must be boss of the department and have all the mechanical skills necessary to supervision. Like any other efficient and respected boss he should not expect his subordinate (the machine) to do anything that he, himself, can't do; be it any individual operation or the attendant tool setup and maintenance. Here again, lower production costs can be attained through combining higher skills and pride in craftsmanship. It's an unbeatable all-American combination.

E. Willard Pennington

editor

A High Production Progressive Die

by F. E. Baldwin
and H. Effgen
Mechanical Engineers
Globe Tool & Gage Works
Boston, Mass.

Confronted with a demand for high quantity production at the lowest possible cost, the progressive die shown in Figure 1 was designed to manufacture the aluminum piece shown in Figure 2. There was also the stipulation that the finished pieces were to be as accurately uniform and uniformly accurate as was technically possible.

Aluminum sheet stock of .038″ thickness is sheared into strips $3\frac{7}{32}$″ wide. The strips are fed into the die from the right and after passing through five successive stations, as indicated by the display strip in Figure 2, a finished piece is ejected at each stroke of the press.

Figure 3 shows a cross-section of the (assembled) progressive punch and die members shown in the photograph of Figure 1, taken through piercing punch P2, and forming punches P3, P4 and P5.

Figure 4 shows the material removed at the first and second station by the side cutter or notching punch P1, pierc-

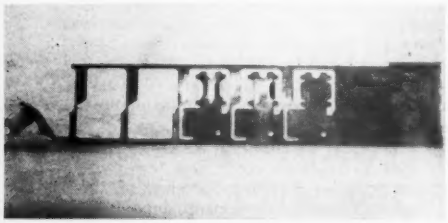


Fig. 1. The five-station progressive die built to produce the aluminum piece shown in Figure 2. The two pilot punches that index the strip, although not lettered, are plainly seen at stations 3 and 4, just beyond forming punches P3 and P4.

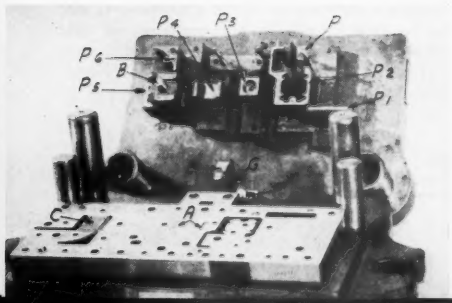


Fig. 2. A display of the successive operations of the five-station progressive die. The first station operation of "notching" the strip to gage width is at the right. Aluminum strips, $3\frac{7}{32}$″ wide, sheared from .038″ thick sheet are fed into the die, Figure 1, from the right.

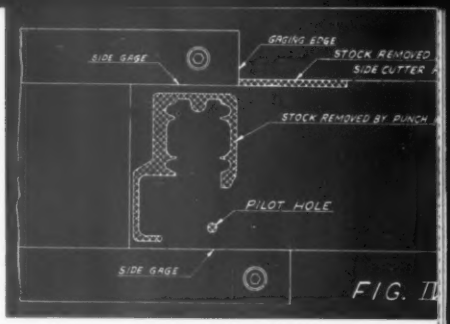


FIG. II

ing punch P2 and pilot hole piercing punch P (Figure 1).

Figure 5 is a section taken across the third station to show the forming pad "A" and its raising mechanism (lever E, cap screw F and spring G) as well as the stock locating pilot for the third station.

Figure 6 is a section taken across the fifth station showing forming pad C, forming punch P5, work holding pin B, and stock removing or work cut-off punch P6 with its pilot.

Figure 7 is an isometric view showing the several forming surfaces and edges of forming punch P5.

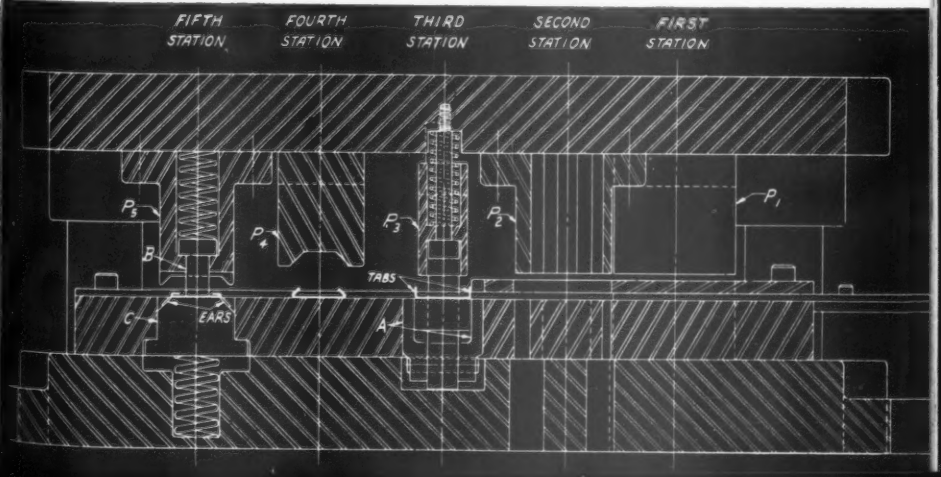
Figure 8 shows in shaded area the stock removed by blanking punch P6 in separating the blank from the strip.

In operation the $3\frac{7}{32}$" wide aluminum strip is fed into the die, from the right, to the gaging edge or end of one side gage, Figure 4. This is the first station and at the first stroke of the press the side cutter punch P1 notches the strip stock as shown in Figure 4.

This notch performs two functions. Its length establishes the stock feeding distance or travel between the first and second stations, and it reduces the strip to the correct width for feeding on through the die as governed by the side gages.

The accurate strip sizing job done by side notching punch P1 eliminates the danger of the strip stock becoming jammed between the side gages because of those irregularities in strip width which often occur in the shearing of long sheets. The accurate establishing of the strip feed travel, which is simply a function of the length of P1, eliminates the necessity of four hand-operated stop pins to gage the strip into the successive stations before an automatic gage could be actuated and carry-on. Beyond these mechanical advantages, the additional cost involved in designing and building the side notcher into the die, and the additional material cost represented by the slightly increased strip width are compensated for by the high production speed attained.

In the second station, Figures 1, 3 and 4, the blank shape (except for the cutting-off to final shape as performed by punch P6, Figure 8) of the product is pierced by the punch P2 which is of corresponding internal profile. Also at this station a round piercing punch P, Figure 1, punches the pilot hole, shown in Figures 2 and 4, which is used for accurately locating the strip for the op-



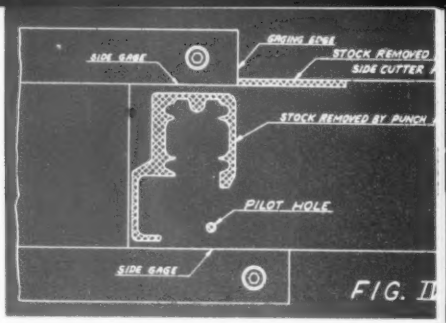


FIG. II

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Figure 7 is an isometric view showing the several forming surfaces and edges of forming punch P5.

Figure 8 shows in shaded area the stock removed by blanking punch P6 in separating the blank from the strip.

In operation the 3½" wide aluminum strip is fed into the die, from the right, to the gaging edge or end of one side gage, Figure 4. This is the first station and at the first stroke of the press the side cutter punch P1 notches the strip stock as shown in Figure 4.

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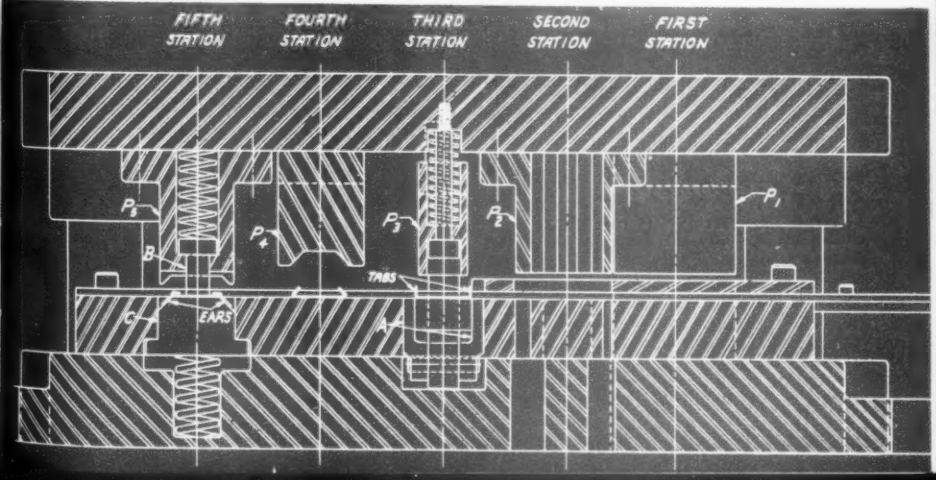

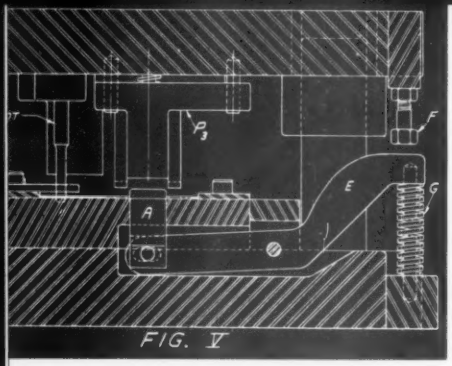

FIG. V

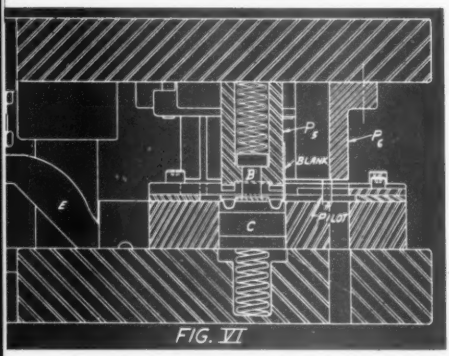

FIG. VI

erations at the succeeding stations. Furthermore, it prevents the production of imperfect blanks due to any slippage of the strip stock resulting from inattention on the part of the press operator.

At the third station, and with the third stroke of the press from the start, the first in a series of three progressive bending operations is performed. A pilot punch enters the pilot hole (pierced in the second operation) and aids in positioning and holding the strip in place. The tabs shown in Figure 2 and 3 are given a 90° upward bend against the forming punch P3 by the raising of member "A" above the face of the die. At the same time, and by virtue of being spring-backed, the forming punch P3 is holding the work against the die face to prevent deformation of the piece during the bending operation. Forming punch P3 bears inside the two tabs while member A is raised by cap screw F, actuating lever E against spring G, Figure 5.

The forming punch P4, at the fourth station, Figure 1 and 3, bends each of the two raised tabs inward to a 45° angle.

At the fifth station, and upon the fifth press stroke of a run, the workpiece is separated from the strip and its forming is completed. Figure 8 shows the stock that is removed by blanking punch P6, Figures 1 and 6, in severing the work from the strip. The pilot on the end of P6 serves to insure accurate locating of the work for the final cut and forming. As the press comes down, the spring-loaded pin B in forming punch P5, Figures 1, 3, 6 and 7, is compressed against the work before punch P6 makes its cut. Continuation of the down-stroke fully compresses spring B which is serving to hold the severed work against the spring-loaded forming pad C, Figures 1, 3 and 6. The spring loading of pad C is

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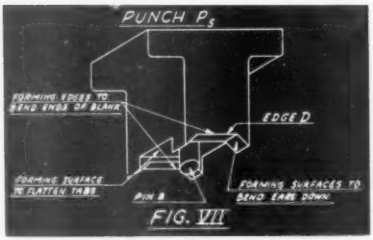

PUNCH P5
FORMING EDGE TO BEND ENDS OF BLANK
EDGE D
FORMING SURFACE TO FLATTEN TABS
PIN B
FORMING SURFACES TO BEND EARS DOWN
FIG. VII

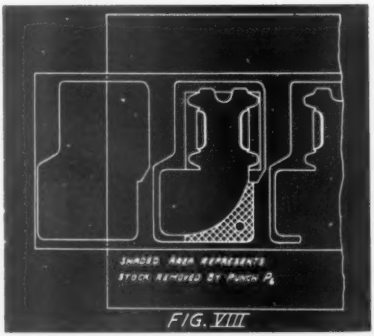
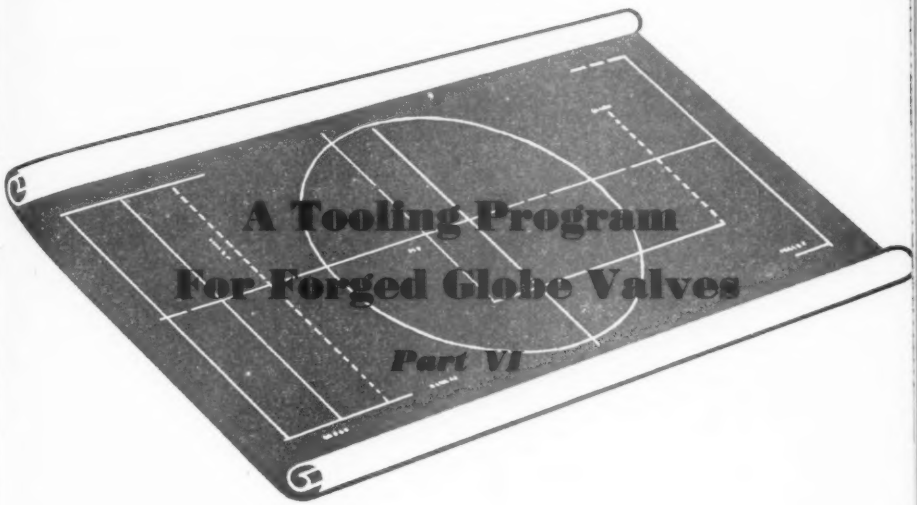


FIG. VIII



A Tooling Program For Forged Globe Valves

Part VI

by Carl F. Benner
Assistant Editor

Packing Cap

The packing cap used on the Parker offset globe valve is shown at C, Figure 24. It is produced from 1⅛" hex brass bar stock and is completely machined and finished on the Greenlee 6-spindle automatic screw machine, with the exception of final burring. The operation of this machine was described in Part V of this series, TDJ, March 1947.

To start the machining of this piece, the bar stock is fed out a predetermined length to the stock stop at the sixth position, the collet automatically closes and locks and the spindle carrier and stock reel index, so that the stock is presented in the first position ready for the first operation. At this position the drilling and rough turning operations are performed. A 25/32" drill and a ⅝" x ⅝" tool-bit are set up in a knee tool holder, mounted in the first position of the main tool-slide. A hole 25/32" in diameter is drilled 5/16" deep and a rough cut is taken simultaneously on the front end of the bar as shown at A, Figure 31. In the second position, drilling and rough form turning operations take place. A 39/64" diameter hole is drilled through the stock from the front end and a rough form cut made on the back end of the piece, B, Figure 31. By the external forming operation, performed in the third position with the dovetail forming tool, G, Figure 31, set up in the cross slide, the packing cap is brought to the external shape shown at C, Figure 31.

The function of the packing cap of the Parker offset globe valve is that of compressing the packing material in order to prohibit leakage past the stem. It is necessary in the assembly and maintenance of the valve to use a wrench to tighten the cap, therefore provision for a wrench grip on the cap is assured by the hex shape of the bar stock from which the cap is made. So as not to disturb this hex shape in the machining operation, the dovetail form tool is designed so that no cut is taken from that portion of

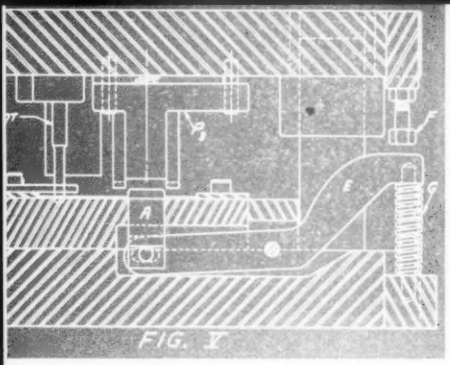


FIG. V

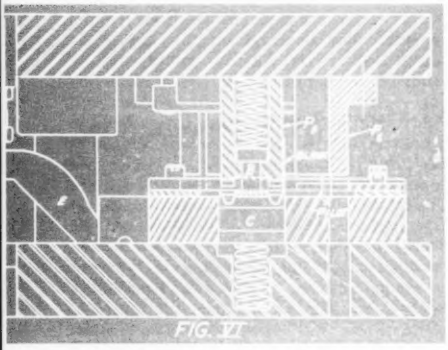


FIG. VI

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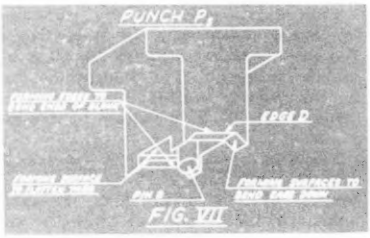

FIG. VII

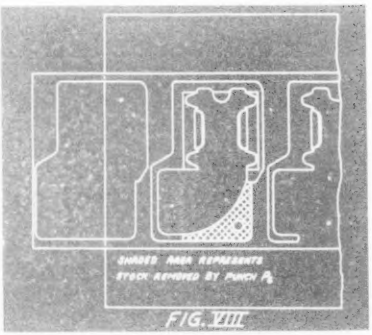

FIG. VIII

A Tooling Program For Forged Globe Valves

Part VI

by Carl F. Benner
Assistant Editor

Packing Cap

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To start the machining of this piece, the bar stock is fed out a predetermined length to the stock stop at the sixth position, the collet automatically closes and locks and the spindle carrier and stock reel index, so that the stock is presented in the first position ready for the first operation. At this position the drilling and rough turning operations are performed. A 25/32" drill and a 5/8" x 5/8" tool-bit are set up in a knee tool holder, mounted in the first position of the main tool-slide. A hole 25/32" in diameter is drilled 5/16" deep and a rough cut is taken simultaneously on the front end of the bar as shown at A, Figure 31. In the second position, drilling and rough form turning operations take place. A 39/64" diameter hole is drilled through the stock from the front end and a rough form cut made on the back end of the piece, B, Figure 31. By the external forming operation, performed in the third position with the dovetail forming tool, G, Figure 31, set up in the cross slide, the packing cap is brought to the external shape shown at C, Figure 31.

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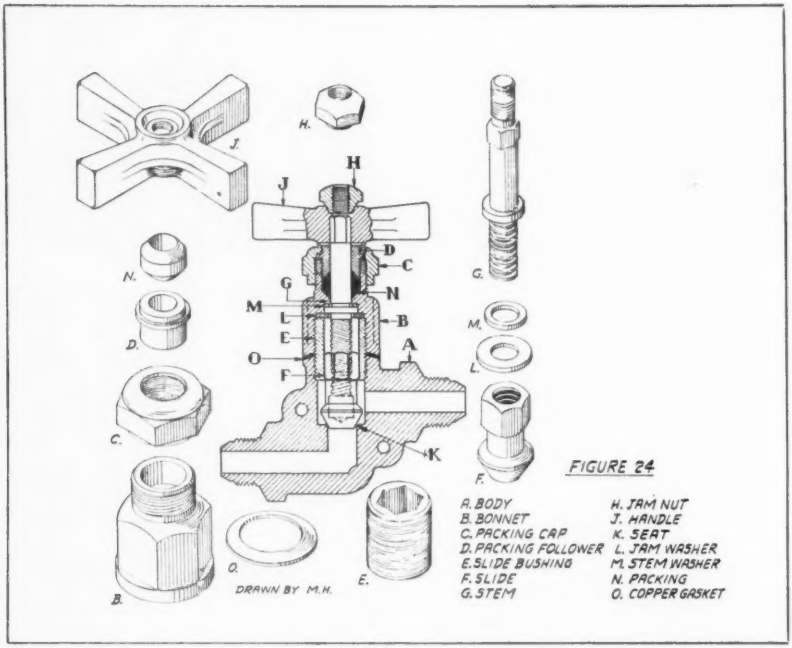


FIGURE 24

Fig. 24. Cross-sectional view of a Parker Brass Offset Globe Valve. Machined, working parts of the valve other than the forged body are shown and identified for the respective tooling operations.

the hex bar stock which is to serve as the wrench grip. This is evidenced by the relief space between the cap and form tool profile shown in C, Figure 31. Internal forming of the cap is done in the fourth position, D, Figure 31, by a step counterbore mounted on the main tool-slide. This tool faces off the bottom end of the cap, increases the inside diameter of the 25/32" hole to that of the minor diameter of a ⅞"—18 thread, squares the bottom of this hole, enlarges the 39/64" (.609") diameter hole to .626", and countersinks a thread chamfer for the start of the tapping operation in the next position. A ⅞"—18 tap is set up in the fifth position of the main tool-slide for internal tapping as shown at E, Figure 31. Burring the tapped internal threads and cutting off the completed packing cap takes place in the sixth position, F, Figure 31. The burring is done with a countersink set up in the sixth position of the main tool-slide and the cutting off by a cutoff tool mounted on the sixth position cross-slide. The burring operation is of relative short duration; therefore, it is completed and the countersink retracts before the cutoff tool finally breaks through.

Usually a burr will be turned over around the inside edge of a drilled hole in a workpiece during any cutting off operation. Standard instructions at the Parker Appliance Company call for the removal of all burrs. Therefore any burrs which cannot be removed during the operations at any of the regular positions on the automatic or hand screw machines, lathes or other metal cutting machines must be removed by the Burring Department. Usually deburring is done with a properly designed deburring tool inserted in the chuck of a drill press.

A jig is mounted on the drill press table with which to hold the workpiece during the deburring operation.

Because the packing cap has a hole drilled through it, and since the cutoff tool turns a burr on the inside edge of the drilled hole as it breaks through the brass on the cutoff operation, the burr has to be removed as an additional operation by the Burring Department.

Packing Follower

This component is completely machined with the exception of the finish deburring on a ⅞" 4-spindle Conomatic, built by the Cone Automatic Machine Company, Inc. The front view of a Conomatic is shown in Figure 32. The main tool-slide, Figure 33, is a heavy, flat, rectangular member supported on

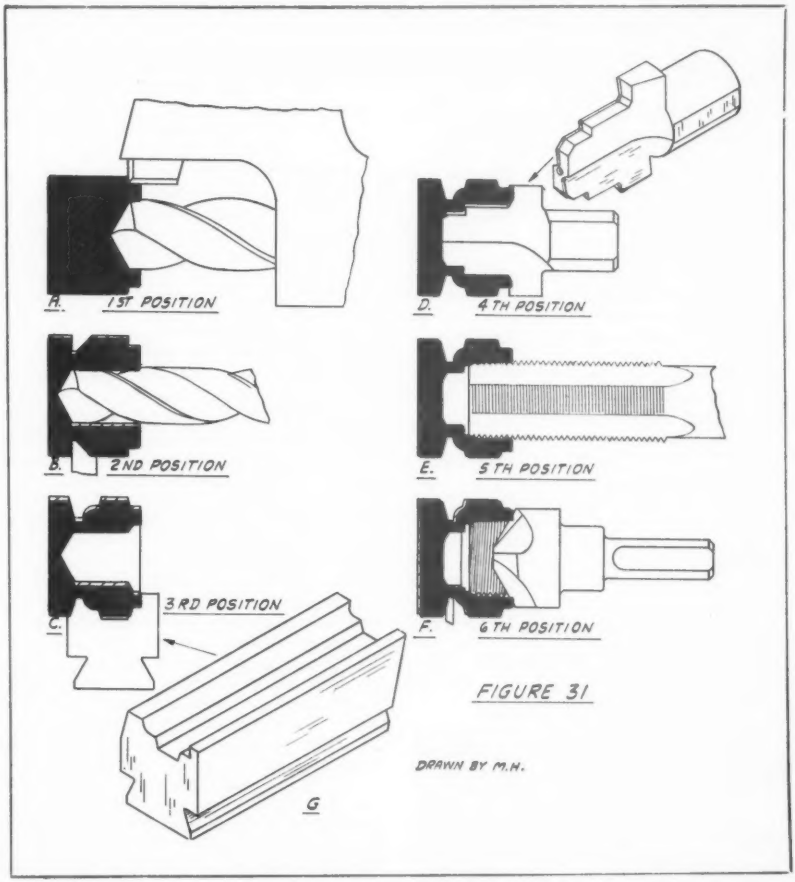


Fig. 31. The tools and setups utilized in the successive positions of the Greenlee 6-spindle automatic screw machine. The colored sections show the respective changes in shape imparted to the valve packing cap by these tools at their respective positions.

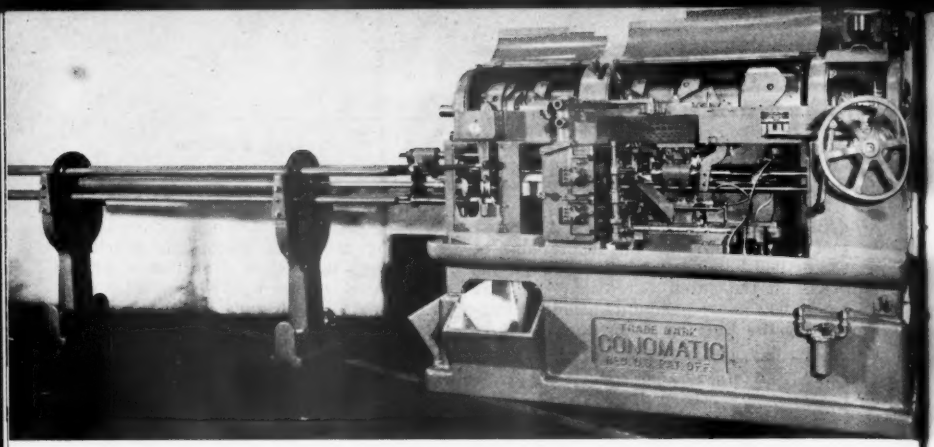
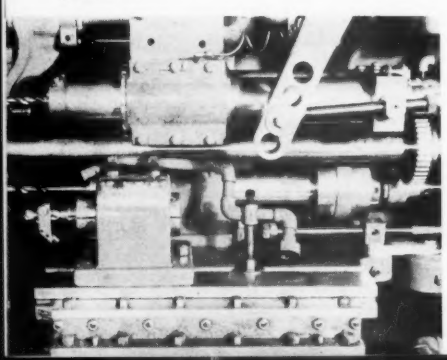


Fig. 32. Front view of the 4-spindle Conomatic built by the Cone Automatic Machine Company, Inc.

the base of the machine by hardened and ground bearing plates. It is of liberal length and is provided with two T slots for positioning drill holders, turners and roll supports. The slide is driven by its cam on the overhead camshaft through a rugged arm held between the top bed and base of machine. Endworking sizes are controlled by a positive stop.

The 4-spindle Conomatic is equipped with four cross-slides held in the heavy front upright support between top bed and base. The slides are independently operated by their respective cams on the single overhead camshaft. Figure 34 shows two drills mounted on the main tool-slide in the first and fourth positions and a forming tool in the lower front (1st position) cross-slide and a cutoff tool in the upper front (4th position) cross-slide. The thrust of a first position heavy forming cut is well supported against the base of the machine. Holders for these tools are shown held securely in the slides by clamps. Individual adjustment screws locate the tool holders radially, and lateral adjustment is provided by taper wedges operated by collar screws.

Fig. 33. Front view of the Conomatic main tool-slide. The upper holder is in the fourth position and the lower holder is in the first position.



The bar stock is fed out after the finished work is cut off in the fourth position and the indexing movement of the carrier presents the stock to the first position. The stock stop, shown in the illustration, swings into position before the bar stock is fed out and returns to an out-of-way position afterwards.

Figure 35 illustrates the two cross-slides on the rear side of the machine. These slides are constructed similarly to those on the front side; they are also cam operated by independent cams on the single overhead camshaft. Form tool holders are interchangeable for all four cross-slides and are provided with the same means of radial and lateral adjustment. The extra sturdy construction of the lower (2nd position) slide assures adequate support for the heavier forming cuts often desired in this position.

It can be seen from the front view of the Conomatic shown in Figure 32 that the main tool-slide and front cross-slides are quite accessible for the operator. Since forming and threading operations are usually performed in the second and third positions where the operator's attention is needed, it is evident, from

Figure 35, that the rear main tool-slide and rear cross-slides are just as accessible as the front slides. Thus, an operator can work at both the front and rear of a Conomatic.

The carrier revolving mechanism is shown in Figure 36. This mechanism consists of a carrier revolving head with four pairs of hardened and ground steel lugs located radially at 90° intervals. It is supported by the left-end frame member, and is operated by an indexing arm driven from the camshaft through gears. The four pairs of lugs and the indexing arm comprise a modified Geneva movement. The revolving head is connected to the spindle carrier by a central carrier revolving shaft and it is connected to the stock tube reel by a coupling mounted on the outer end of the revolving shaft.

The workpiece shown in the illustrations of the Conomatic is not a Parker valve part but represents the typical operations which take place on these parts.

The packing follower, D, Figure 24, is machined from ¾" round brass bar stock with the cycle of operations starting in the fourth position where the bar stock is fed out to the stop, the collet automatically closes and the spindle carrier indexes to the first position.

The operations performed in the first position are center drilling the end of the bar and rough forming the outside surface. For these operations a center drill is mounted in a holder on the main tool-slide and a form tool on the cross-slide, which together produce the shape shown at A, Figure 37. The outside diameter of the shoulder on the packing follower is ¾" which is the same as the bar stock size from which the follower is made. Therefore, it is evident that the surface of the shoulder must not be touched by the form tool. This results in the form tool design shown at A, Figure 37.

A 21/64" hole, 19/32" deep is drilled in the second position, B, Figure 37, with the drill set up in a holder on the main tool-slide. The cross-slide is not used in this position. The OD of the packing follower is specified as $.624^{+.000}_{-.002}$. To insure production of this part within the specified tolerance, it is finish machined by a shaving operation utilizing a dove-

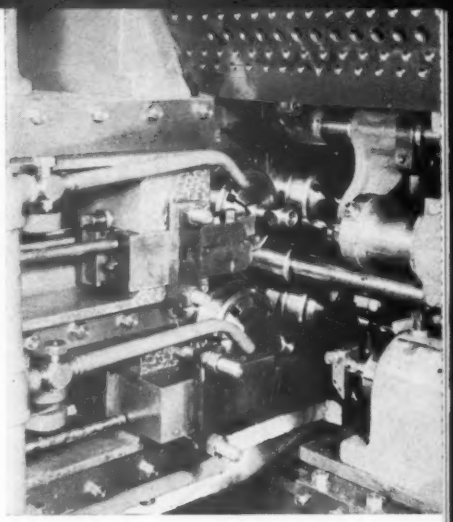
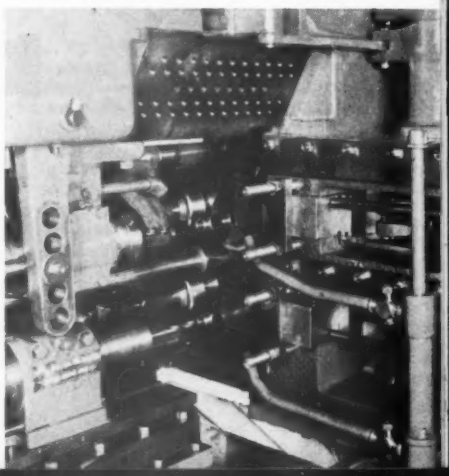


Fig. 34. Front view of the Conomatic cross-slides, showing the first position cross-slide at the lower left front and the fourth position cross-slide in the upper left front.

tail form shave tool. The shave tool is inserted in a shave tool holder, E, Figure 37, which also carries a shave roll.

The design of the shave tool holder provides for the setting up and locking of the form shave tool and the shave roll carrier in the holder so that the dimen-

Fig. 35. Rear view of Conomatic main tool-slide and cross-slides. The second position of the main tool-slide is shown at the lower left and the third position of the main tool-slide at the upper left. The second position cross-slide is shown at lower right and the third position cross-slide at upper right.



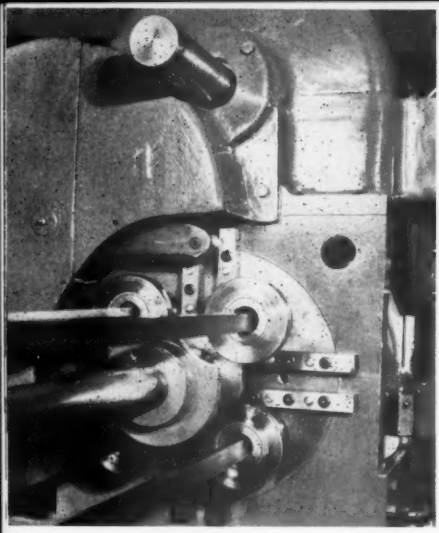


Fig. 36. The carrier revolving mechanism. The four pairs of lugs and the indexing arm comprise a modified Geneva movement.

sion from the bottom of the roll to the top surfaces of the shave tool corresponds to the specified OD of the workpiece. This assembly is spring loaded which permits a small up and down movement on guide pins. As the shave tool assembly, mounted in the third position of the cross-slide, moves into the work the shave roll strikes just below the top surface of the work and is forced up so that it rides on top of the work thereby bringing the shave tool into a position to take a tangent cut from the lower part of the work. Because there are two outside diameters on the packing follower, to insure greatest accuracy the shave roll is designed to contact only one diameter of the part, C, Figure 37.

(CONTINUED ON PAGE ~~125~~ 133

Fig. 37. The tools and setups used on the 4-spindle Conomatic in machining the valve packing follower. The shape transferred to the workpiece by each tool is shown by colored section in the sequence of operations as performed at the four positions. Note at E the tool-holder floating (spring loaded) head that carries the shave roll and dovetail shave form tool in fixed relationship. This permits workpiece tolerance to be independent of, and closer than, spindle carrier indexing tolerance.

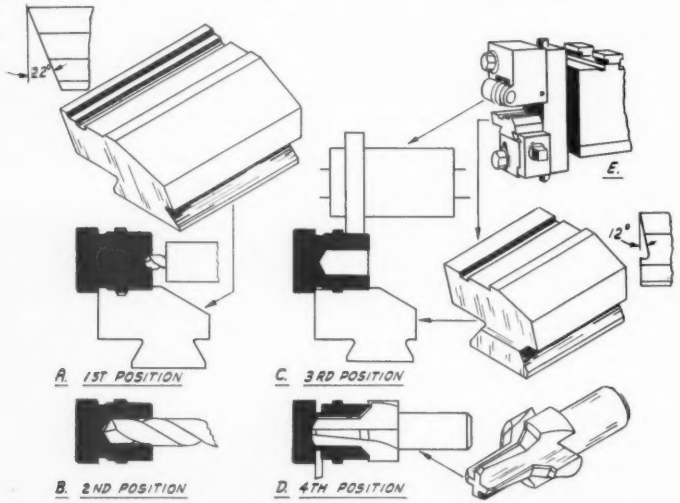


FIGURE 37

DRAWN BY M.H.

Machining With Precision Saw Blades

Applications in the field of machining with precision saw bands expanded tremendously throughout the war, but particularly so since the latter part of 1944 when the introduction of the high velocity technique just about revolutionized band saw practice as a whole. To benefit primarily from the substantial increase in velocities were the non-metals and non-ferrous metals, and in the latter category the light metals have responded most efficiently. Bear in mind that we are still concerned with actual sawing with a high velocity range of from 1500 to 5000 fpm.

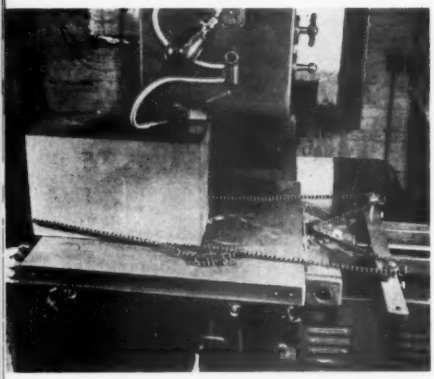
by H. J. Chamberland
Springfield, Mass.

On the other hand, these improved saw bands have likewise brought about a rather brisk revival of the old art of friction sawing. In this case, these high and super-high velocities, through the generation of heat, soften the material in front of the saw teeth sufficiently so that a 1"—10-pitch band revolving at 13,000 fpm can slice through ¾" armor plate or stainless steel at the rate of almost 14 lineal inches per minute.

True enough, all this outstanding increase in efficiency would seem of minor interest to the tool or die maker until he realizes, as he should, that these radically better saws must necessarily have some bearing on his own work. They surely have, since the type of blading regularly used now for conventional sawing is identically the same as used for friction sawing. In other words, a saw that will resist the strains of friction sawing for hours and even days with the maximum of feeding pressure imperative therewith, will obviously also stand an unprecedented amount of work pressure at regular velocities with, of course, a proportionate increase in cutting rate.

Modern saw bands are long-life cutting tools providing they have the correct depth of tooth hardness, and this property is most important. When friction sawing, for example, the teeth must become blunt before the saw reaches its peak of efficiency which it will maintain until the teeth have worn down approximately 70%. It is the correct depth of tooth hardness, extending to but not beyond the gullet line, which makes the

Fig. 1. Band sawing through a ¼ ton die block of a thickness or height equal to maximum machine capacity with the same degree of perpendicular accuracy of cut as is attainable with only 2" stock thickness. In terms of efficiency this means that due to controlled depth of tooth hardness, saws have no longer a tendency to "lead off," hence increased work pressure may be applied with a relative increase in cutting rate.



teeth so tough and helps them maintain the set. Consequently, such a saw band has ample flexibility elsewhere throughout its section so as to withstand the strains of contour sawing as readily as straight sawing.

Specialized band sawing, or contour sawing, has long been accepted as an essential phase of machine shop practice. This is verified by the fact that this method of cutting represented one of the subjects included in the TOOL & DIE JOURNAL "Training for Victory" program. Although the innovation of high velocity equipment has changed the production floor picture materially, conventional velocities will never be eliminated from tool room applications but, in this connection, better saws have gradually enlarged the field of applications because of the longer tool life and higher cutting rates resulting.

Since the advantages of the process as a whole need not be repeated, what is of utmost significance to the tool and die maker therefore are recent facts and figures. These should afford reliable means for the old operator to make comparisons with production rates dating back a few years; the new operator can likewise use the data to good advantage and thereby increase his dexterity.

The following test case histories describe various laboratory customer tests representing late recommendations of a nature to be of general tool room interest. These applications should at least serve as a stepping stone to formulate somewhat similar saw control factors, and thereby save considerable cut-and-try time. Needless to mention that the one and only objective of each test is to determine the correct type of saw, velocity and work pressure that will produce a maximum cutting rate consistent with tool life. The quality of finish desired is often, however, a limiting specification and its observance results in a reduction in cutting rate.

Test Case I

Material: Finkl steel die block, 10¼" thick (515 pounds).

Saw Control Factor: 1"—3-pitch Buttress saw running at 75 fpm, 35 lbs. table pressure—70 lbs. work pressure. 20 drops of cutting oil per minute as lubricant. Average cutting rate: 1.18 square inches per minute.

Remarks: Co-ordination of proper feeding pressure, blade tension and the application of cutting oil should help maintain perpendicular accuracy within .003". New type, coarse pitch, saw is in greater part responsible for a 25% increase in cutting rate, in this particular case, over that of regular 6-pitch precision band.

Test Case II

Material: Clarite high speed steel (18-4-1) 2¼" thick (forging).

Saw Control Factor: ¾"—6-pitch standard saw running at 50 fpm, 50 lbs. feeding pressure. No lubricant. Average cutting rate: .70 square inches per minute.

Remarks: After cutting 100 square inches, the saw set had worn but .002" and no change in sharpness was noticeable. Where the increase in cutting rate is negligible, extension of saw life will be substantial.

Test Case III

Material: Ermalite, alloyed gray iron, 6" thick.

Saw Control Factor: 1"—3-pitch Buttress running at 65 fpm, 66 lbs. feeding pressure. No lubricant. Average cutting rate: 2.04 square inches per minute.

Remarks: The cutting rate is exceptionally high on this type and thickness of material considering the fact that the saw cuts approximately 400 square inches before showing any real sign of wear.

Test Case IV

Material: Carbon steel, No. 1090, 4" thick.

Saw Control Factor: ¾"—6-pitch standard saw running at 125 fpm, 55 lbs. feeding pressure. 20 drops of cutting oil per minute as lubricant. Average cutting rate: 8 square inches per minute.

Remarks: Under above recommendations the estimated saw life in this case Machining With Precision Saw Bands—2 is about 100 cuts of 6 square inches, with an excellent finish. Due to extremely low tool cost, cutting rate as given may be substantially increased by disregarding saw life and degree of finish to any reasonable extent.

Test Case V

Material: Semi steel blank, ⅜" thick; a cam contour sawing application.

Saw Control Factor: ⅛"—18-pitch standard saw running at 175 fpm. Medium hand feeding pressure. No lubricant. Average cutting rate: 2.5 lineal inches per minute. Cam cut to within .005" of outline, finish produced by band filing with results equal to conventional procedure.

Remarks: The design of this cam represented radii ranging from ¾" to 2" with an overall lineal-inch cut of 21". The total machining time, sawing, filing and setup was 40 minutes against an estimated 6 hours if generated conventionally. This cam is of course a reproduction and not an original, no claim is made that a cam from engineering department layout can be accurately produced by contour sawing.

Test Case VI

Material: Sheet steel, 1/32" thick, stack-sawing application.

Saw Control Factor: ¾"—10-pitch standard saw running at 125 fpm. Medium hand feeding pressure. No lubricant. Average cutting rate: 2.12 lineal inches per minute.

Remarks: The application demonstrates the economy of the contour sawing procedure to make short run production stampings. This is an experimental job requiring 75 pieces; they were cut in two stacks of 35 and 40 sheets, respectively. This operation of course requires soldering or bead welding the stack at corners and various other locations under pressure in order to eliminate air pockets or spacings. The outline comprises a total of 38 lineal inches; with the possible cutting rate it is evident that this method is most economical for even a 1000 piece requisition.

Acknowledgment: Customer test data is through co-operation of the laboratories of The DoALL Company, manufacturers of The DoALL contour saws and saw bands.

Fig. 2. Cutting the teeth in an experimental ring gear segment with a ⅜", 14-pitch standard type precision saw band. The development of these better cutting tools has widened the field of applications for expediting the production of experimental and emergency replacement parts.

Twenty-Five Single Point Tool Operations At One Setup

An entirely new Multi-Operation Chucking Machine has just been announced by Hardinge Brothers, Inc., Figure 1. Because of the universal acceptance of the Hardinge Second Operation Machine by production departments, the real need for a precision machine for relatively small work was emphasized. Investigation showed that there was a similar need for a precision chucking machine to take care of large diameter work. It was realized that such a machine would have to produce work to an accuracy that heretofore was associated only with smaller diameter work. This meant an entirely new machine to fill the gap which existed between the Second Operation Machine and large turret lathes, thus came about the development of the Hardinge Multi-Operation Chucking Machine.

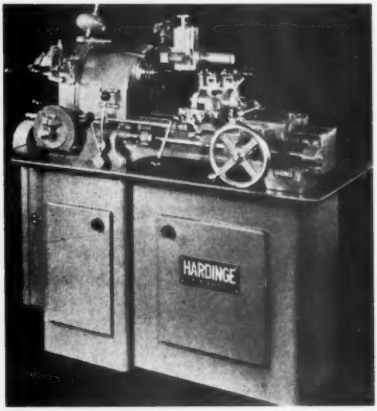


Fig. 1. Front view Hardinge Multi-Operation Chucking Machine.

The Hardinge Multi-Operation Chucking Machine has been designed for turning, boring or threading parts up to 6" in diameter which have been blanked out on automatic screw machines or turret lathes or for finishing stampings, castings, forgings and many other types of work that ordinarily require many individual setups.

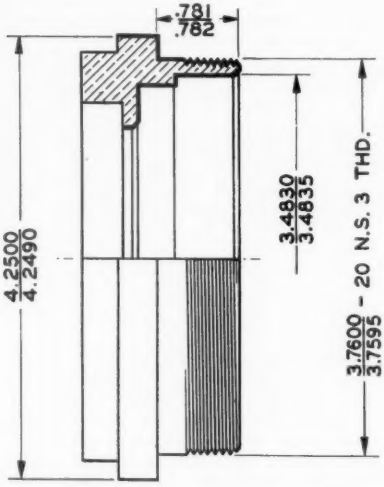


Fig. 2. Typical part requiring the machining of twelve surfaces with an additional threading operation. The surfaces are all finished with single point tools.

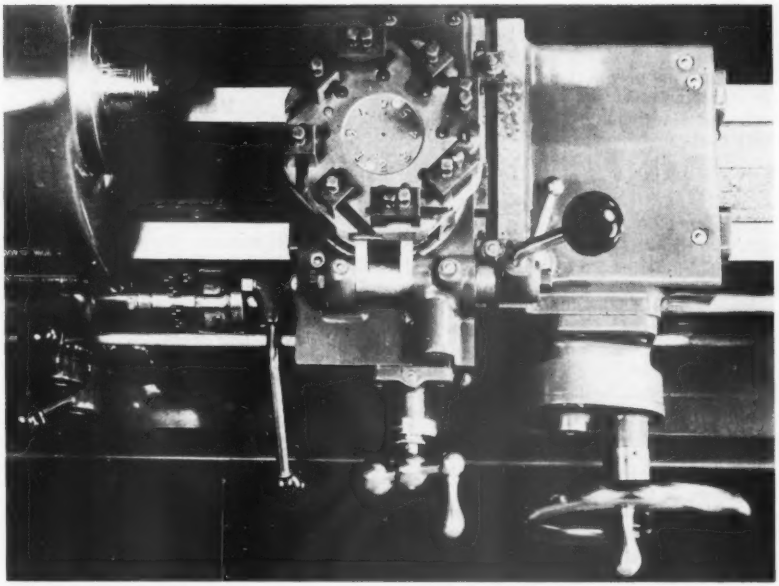
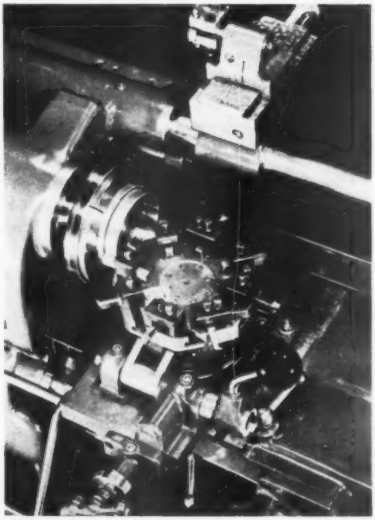


Fig. 3. Operator's view of working area of eight-position cross sliding carriage type turret.



Typical examples are the many parts requiring threads to be cut concentric with turned and bored diameters, as well as square and true with shoulders on the work.

A typical part is shown in Figure 2, requiring the machining of twelve surfaces with an additional threading operation. The surfaces are all finished with single point tools. Ordinarily, machining such parts requires planning, the applying of skilled operators and many separate machines and setups. Parts requiring many bored diameters and turned diameters that must be relatively concentric, as well as having a

Fig. 4. Threading head shown separate from the turret. Also close-up view of Hardinge Multi-Operation Chucking Machine turning large diameter. Standard step chucks are used for holding the part. The use of simple 3/8" square tool bits and the working of the turret right up close to the work eliminates long springy tooling—means greater accuracy.

fine finish, can be produced on a rapid production basis on a Multi-Operation Chucking Machine. The eight-position turret and the production threading head use standard tools, making simple setups permissible for low cost tooling and low setup costs for short runs.

Turret

The eight-position turret, Figure 3, permits greater tooling possibilities over the six-position turret. The turret is built into the carriage, thereby making it cross feeding which permits work to be bored, turned, and faced from the turret with extremely short length tooling. This is possible because the face of the turret can be brought right up to the work which eliminates long springy turret tooling, assuring maximum accuracy. The cross feeding turret can be either screw fed or lever fed. A built-in feature is the mechanism which permits the adjustment of each turret station without affecting the other turret stations. This adjustable turret station feature is for final adjustment of the cutting tools. The turret takes standard ⅜" square tool bits or ⅜" x ¾" rectangular tool directly on the hardened and ground steel top surface. Through the use of single, double and triple tool holders, as high as twenty-four single point tool operations can be performed in one setup.

Threading Unit

The precision threading unit, shown at top in Figure 4, is separate, which is equivalent to adding a position to the turret for other tooling. This threading head is controlled by a precision master lead screw mounted directly on the rear of the headstock spindle. There are no intervening gears; therefore, accurate duplication of the lead screw pitch is assured. Threading is performed at speeds usually only associated with turning operations. For example, 1½"—20 threads are cut in steel at 500 rpm. A 3"—24 thread is cut on an aluminum casting at 1500 rpm. It is not necessary to cut thread relief in the work as the thread length control automatically lifts the tool from the work at the end of the cut. Threads can be cut within one-half turn from the shoulder.

Headstock

The headstock spindle has a speed range of 150 to 3000 rpm in either forward or reverse direction. The spindle takes standard 5c collets, providing a 1" round collet capacity through the spindle. Step chucks provide collet-like chucking of work up to 6" in diameter. Through the use of two, three or four jaw chucks, odd shaped castings, stampings and forgings may be chucked.

Bed

The bed has hardened and precision ground steel dovetail ways, designed so that the forces resulting from the work cutting load apply a holding-down action which eliminates chatter and vibration.

Carriage

The carriage is of generous proportion but yet sensitive enough to give the operator an unusually fine "feel," an absolute necessity when machining to precision tolerances.

Typical examples of work being machined, detail description of various units and specifications are contained in Bulletin HP.

The features of high spindle speed preloaded ball bearing spindle construction, coupled with the eight-position cross feeding turret and production threading head, allow extremely close tolerance work to be performed in one chucking that would ordinarily require several subsequent operations.

Bulletin HP will be sent free on request from Hardinge Brothers, Inc., Dept. 5-82, Elmira, N. Y., or use our postage-free INFORM-A-GRAM Key No. 582-W.

Fast Jig And Fixture Setups

A well-known practice in the making of adjustable drill jigs and fixtures is embodied in the "Speed Jig" equipment, formerly known as Borlocator and now being manufactured in improved form by the Superior Sales and Engineering Company of Cincinnati, Ohio.

The Speed Jig is licensed under the inventions of Guy Connor, who, in tool making and designing, had observed the frequent recurrence of sufficiently similar jobs to warrant the making up of basic jig parts such as could be used, dismantled, rearranged for different jobs, and, at any time, reset to previous specifications wherever a job was to be repeated. The new Speed Jig "tooling" is based on refinements and improvements on this basic idea.

The Speed Jig is made up of a small and simple variety of elementary but precision-made members that can be easily and accurately assembled into an unlimited variety of jig and fixture patterns for the economical, small-lot production of interchangeable parts calling for drilling and reaming such hole layout patterns as circular, square, rectangular or irregular, and in one or more planes. This flexibility of construction and application results in the many other practical uses for the Speed Jig, including:

1. An accurate method for transferring hole locations;
2. A precision layout fixture;
3. A master setup for coordinating drill jigs;
4. For drilling sample stampings and castings
5. As temporary jig while production jigs are being built.

The basic parts making up the Speed Jig are the frame bars, corner plates, bushing plates, and lock clamps. These are shown and identified in Figure 1 which represents a Speed Jig assembly for drilling four equi-spaced holes on a bolt circle.

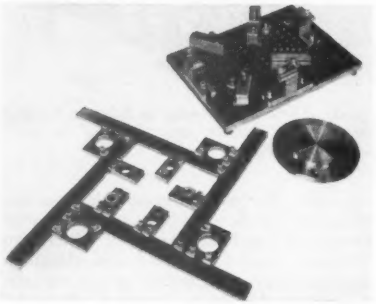
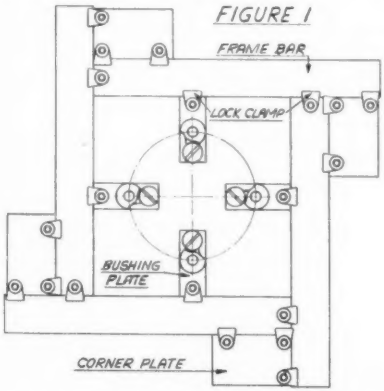


Fig. 2. The Speed Jig drill plate assembly of frame bars, corner plates and bushing plates, and the base plate with its work locating and clamping fixtures, supporting posts, height blocks and clamps for positioning the drill plate over the work.

Fig. 1. A symmetrical assembly of Speed Jig parts for the equal spacing of four holes on a bolt circle. When the closest possible spacing of holes is specified, bushing plates are available



which have the shoulder bushing lock screw on the other side of the bushing thus permitting the bushings to be "clustered" virtually in contact with each other.

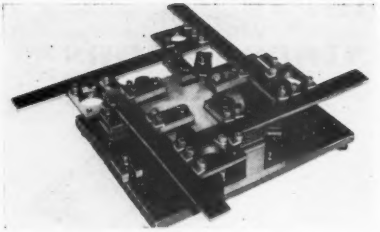


Fig. 3. The complete setup of Figures 1 and 2 with bearing retainer plate clamped in place ready for drilling.

One of the most recent additions to the Speed Jig family of toolmaking components is the base plate, on which the workpiece may be located and clamped. The base plate is provided with a pattern of tapped holes on ¾" centers. In addition to the locating and clamping fixtures for the workpiece that are mounted on the base plate, supporting posts which are adjustable in height by means of raising blocks are also mounted on the

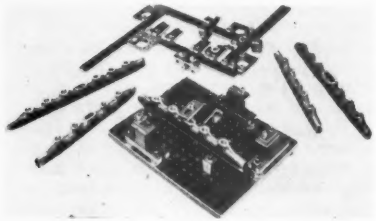


Fig. 4. The "tooling program" for the drilling of five different castings in one basic Speed Jig setup. The changes necessary to convert from any one hole pattern to another can be made in less than five minutes.

base plate. On these supporting posts, the Speed Jig "drill plate" is clamped in accurate location relative to the workpiece being machined.

Figure 2 shows a Speed Jig drill plate assembly of frame bars, corner plates and bushing plates, as well as the necessary base plate assembly made up of work locating and clamping fixtures, plus the supporting posts, raising or height blocks, and clamps for positioning the Speed Jig over the work. This is a setup as used for drilling five equi-spaced bolt circle holes in the bearing retainer plate, also shown. Figure 3 shows the completely assembled Speed Jig for this job, and with the bearing retainer plate in position, as the whole combination would be handled on the drill press table.

Fig. 5. One of the completed combinations of Figure 4, with a casting located for drilling. After drilling the first hole the drill bushing is slipped into the succeeding bushing plates.

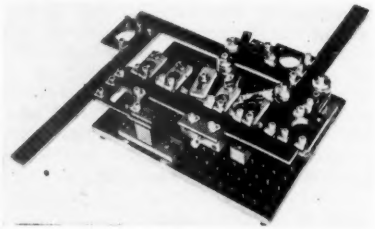


Fig. 6. Detailing the step-by-step procedure in building a Speed Jig for locating three equi-spaced holes on a bolt circle.

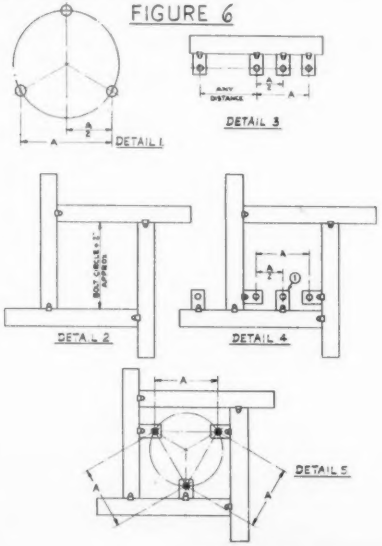


Fig. 7. A setup for drilling four holes, unsymmetrically spaced and at four different levels, employing the additional features of location extension bars, swivel clamps and height spacers.

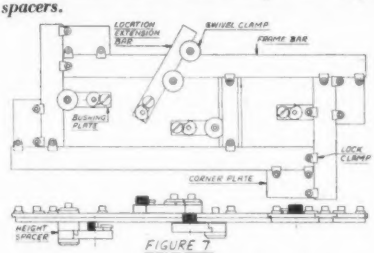


FIGURE 7

Figure 4 illustrates a "tooling program" that is indicative of the universality, flexibility and economy of the Speed Jig. It is from the plant of the Electric Railway Equipment Company of Cincinnati, Ohio, and involves the drilling of five different parts in one basic Speed Jig setup. Any of the five cast-

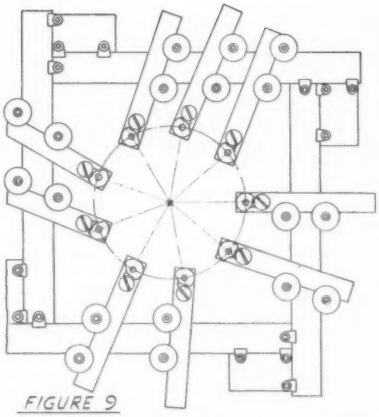


FIGURE 9

Fig. 9. This layout for nine equi-spaced holes on a bolt circle evidences the flexibility and quick setup gained through use of the location extension bars.

Fig. 8. The double wedge means of locking Speed Jig parts insures rigidity, holding power and the retained accuracy of initial settings.

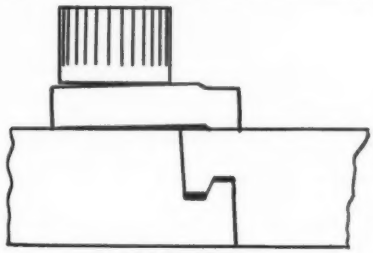


FIGURE 8

ings, of varying dimensions and with different numbers of holes, can be located and clamped in the V-block fixtures on the base plate. The Speed Jig drill plate that is positioned over the work is the same in all instances with the exception of the bushing plates. These latter vary in number and drill bushing size for each job, but the changes necessary to accommodate one job after another are effected in less than five minutes. The whole jig is assembled from standard parts and it is reported that by this method the tooling cost for the job was reduced by 75 per cent. Figure 5 shows a completed assembly of one of the combinations with workpiece in place all set for drilling.

The geometrical layouts and dimensioning for Speed Jigs are easily reduced to drafting room procedures and result in accurate and foolproof assembly instructions. Figure 6 outlines the procedural steps for building a Speed Jig for locating three equi-spaced holes on a bolt circle. Detail 1, Figure 6, represents the job as given.

For a bolt circle of any given diameter

FIGURE 10

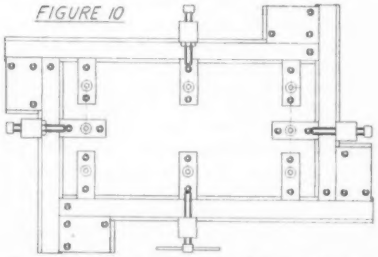


Fig. 10. A Speed Jig assembly functions as a drill plate by the addition of stop blocks for insuring accurate work location.

the dimensions A and A/2 are a matter of engineering handbook reference. The next operation is that of assembling a square frame, Detail 2, by means of four frame bars and the necessary lock clamps. The size of the inside square should be approximately 2" greater than the diameter of the bolt circle.

Next, using another frame bar and four bushing plates (with bushings of the hole size to be used in the finished fixture) and lock clamps, a gage is made, as shown in Detail 3, incorporating the hole center-to-center distances of A and A/2, plus the "any distance" dimension which can be anything that will not conflict with a frame bar.

In accordance with Detail 4, Figure 6, four bushing plates are located on the Speed Jig frame so as to approximate the center-to-center distances of the gage bar bushings. With dowels in the gage bar bushings (making it a multiple pin gage) the four bushing plates in the Speed Jig frame are accurately located to "gage size" and securely locked. Constantly checking "gage size" during the clamping insures the final accurate dimensional relationship between bushing plate No. 1 and the frame bars. The outer (left-hand) bushing plates on the gage bar and frame insure the geometric accuracy of this operation.

After attaining the above gage size of frame and bushing plates, the "outboard" bushing plate on the frame is removed, and the other two (aside from No. 1) are loosened and slid to the approximately final position. The final, precise position is attained by adjusting them each to distance A from bushing No. 1 as indicated in Detail 5. The exactness of this dimension is attained by reference to distance A of the gage bar. When the pin gage pair representing dimension A can be interchangeably located in any two of the three bolt circle bushings, final lock up is made and the Speed Jig is ready for use.

For drill jig designs that call for locating the drill bushings in different planes, location extension bars, swivel clamps and height spacers are used. Figure 7 shows a setup for drilling four holes, unsymmetrically spaced and at four different levels or planes on the workpiece. The swivel clamp assemblies grip the location extension bars by the same wedge locking feature that is employed to fasten all Speed Jig components together. This fastening means, shown in Figure 8, insures rigidity of holding and position through the double wedge action that exists between the mating parts as the pressure of the locking screw is applied. Referring again to Figure 7, it will be noted that the location extension bars may be positioned either above or below the frame bars, and at various levels according to the dimensions of the height spacers called for throughout any given job.

The flexibility and quick setup features added to the Speed Jig method by the location extension bars are most evident in a job specification such as that illustrated in Figure 9 which calls for nine equi-spaced holes on a bolt circle.

Where the Speed Jig is to be used as a drill jig plate located directly on the work, stop blocks, as shown in Figure 10, are available. These are fastened to the underside of the frame bars in positions that will insure the correct successive locating of the drill plate on the workpieces.

Additional Speed Jig information and detailed specifications may be had from Superior Sales & Engineering Co., 126 E. Pearl, Cincinnati 2, Ohio, or by use of our postage-free Inform-A-Gram Key No. K82-W.

Hydraulic Circuits And Applications

Part II

Editor's Note: This concludes our third feature presentation of hydraulics know-how from the recent Machine Design Conference of the Cleveland Engineering Society. For the first, "Hydraulic Valves and Control Devices," see TOOL & DIE JOURNAL, November 1946 and January 1947; the second, "Hydraulic Applications From The Users' Viewpoint," appeared in the February 1947 TOOL & DIE JOURNAL.

by Ransom Tyler
The Oilgear Company
Milwaukee, Wis.

The variable displacement type of hydraulic motor, operated under conditions such that constant pressure and flow is maintained at its inlet, will deliver a substantially constant power output with varying speed (displacement) over a range of 3 or 5 to one. However, if the critical range is exceeded, frictional torque losses become great *in comparison* to torque output, and the output characteristics are no longer desirable. The other characteristics could be analyzed similarly. I could give specific figures covering one type and make of unit, but no general figures. However, the important thing to you is how to determine these limitations in your particular case. The key to that is the amount of variation in the characteristic in comparison to the value of the characteristic at the limiting values. Thus, it is the comparison of values that limits range. For instance, a 2% variation in pressure amounts to an insignificant 20 psi at 1000 psi pressure. However, if this 20 psi variation is retained at 100 psi (and most variations change but little with changing characteristics), it will amount to a quite respectable 20%.

Design Compromises

Once the problem has been formulated and the general limitations and tolerances established, it is time to design a circuit. The general processes of hydraulic designing are the same as those of any other type of designing.

The problem must first be stated and the requirements determined. Then the possible solutions must be considered and the one which shows the greatest promise of fulfilling the requirements most fully is explored further. Compromises are necessary between the requirements and the means of fulfilling them, and frequently it becomes desirable to retrace the steps already taken and start out on a new path.

Thus, in designing a hydraulic circuit it is necessary to consider the alternative non-hydraulic methods of accomplishing the result reviewing their possibilities as well as their failings. Being thus reassured that hydraulic methods have the greatest promise of fulfilling the requirements, it becomes necessary to choose which of the general systems of operation will probably be most suitable. It then becomes a problem of determining sizes of units, details of the types of equipment and the exact number and arrangement of connections. In so doing it will surely become evident that the requirements can be compromised in some way to provide a simpler system, or perhaps to provide superior performance in some respects at the cost of reduced specifications in others.

The actual process of designing a circuit is one of trial, check, and revise. There are few, if any, rules for proceeding with this. Mechanical considerations largely determine the types of motors to select, the method of operating the controls, and other such details. The performance specifications dictate such things as pressure ranges best suited for the operation and the complexity of the arrangements.

Fluid Current Inertia

In planning the initial layout, it is often convenient to consider only the normal operation of the machine, and to select units which best perform this operation. It is well to bear in mind that a very wide range of hydraulic devices are considered standard and every effort should be made to utilize them. Time limitations should be carefully considered, as there is considerable tendency to forget that a fluid current has much more inertia than an electric current, and to shut off or reverse the direction of fluid flow in the time an electric switch is flipped would often be unbearably noisy as well as destructive. Ample allowance must thus be made for time losses.

Fluid Power Elasticity

Elasticity is another factor which is often forgotten in the consideration of fluid power circuits. This is a source of time loss, and besides builds a store of energy, which, if released by too fast valving, will cause severe shocks. The importance of elasticity can be roughly gaged by the fact that hydraulic fluids, generally, have a bulk modulus of elasticity of about 1/100 that of steel. Since they are frequently used in a range of pressure, or stress, which is from a fourth to a third of frequent practice on mild steels it can be realized the springiness which might result.

These two factors, together with the leakage, have a great influence on selection of the pressure range operation. Low pressures lead to large units and high rates of flow, and slower operations. Higher pressures lead to more flexibility, or less rigidity, which might result in longitudinal or torsional vibration or chatter. Shock control also increases in difficulty as pressures increase, as more delicate means of control must be provided to control the small volumes thru the large changes in pressure. The effect of leakage is well known. Any given apparatus will leak or slip more at higher pressures. Thus, if leakage is a factor, a reduction in pressure, using the same equipment, is often a remedy for inadequate operation if the penalty of an overpowered machine can be paid.

Determining Specifications

It is in the range of operation characteristics that the compromises with specifications are most frequently necessary. In spite of the flexibility of hydraulic drives, and in spite of the great range of characteristics that can be encompassed in a single unit, there are limitations to maximum and minimum pressures, speeds, and flow rates. In

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POINT No. 4

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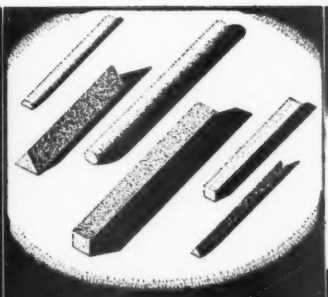

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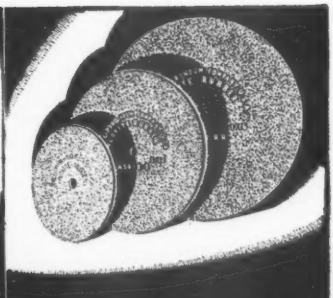

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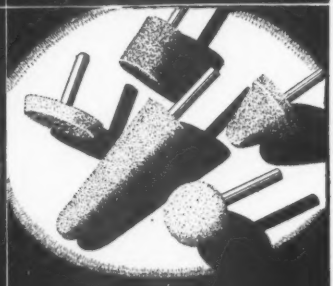

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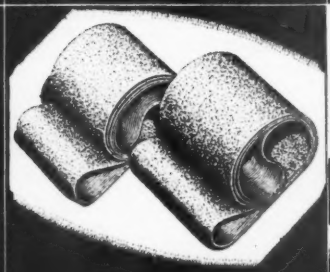

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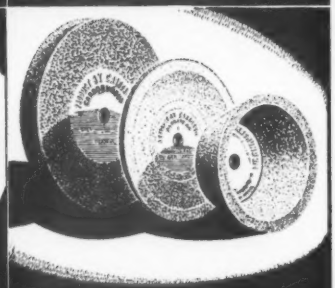

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many cases it is the specification which is at fault. Many specification writers have the careless habit of merely writing "from zero to----", some hypothetical maximum figure. It is impossible to obtain a pressure control which will operate precisely at zero absolute, or even at zero gage, and the same holds true for the other characteristics. The point chosen for the minimum operating point should be very carefully chosen as operation under these minimum conditions is usually the most important, and is without question the most difficult to obtain. However, this minimum is seldom given much consideration by specification writers who are not well acquainted with variable speed units, and a good round figure is set down, which even though it might be nice to be able to operate at, is not practical for use in even extraordinary conditions.

Design Check List

When a tentative scheme has been set out, it is then necessary to check its operation both under normal and emergency operations and to make any necessary changes. While no complete list of check points is available, the following will indicate the scope of items to be considered.

Operation:

Will the system operate?
Will it go thru a required cycle without stalling and repeating, etc.?
Is the sequence correct?
Is it sufficiently interlocked?
Is there a provision for return fluid where necessary?
Is the pump suction adequate?
Will air be cleared?
Will the pipes drain out during idle periods causing a malfunction on starting?
Is the unit protected against extremes of temperature?

Safety & Emergency Operation:

Can the unit be stopped instantly at any time?
How is it started normally?
Can it be damaged by starting after an emergency stop?
How is it recycled?
What "inching" functions are required?
Will any element fall unexpectedly from lack of positive support?
Will creeping take place when idle?
What will happen if a fuse blows?
Will it take care of itself if left unattended?

Performance:

Will the equipment do the job?
Has it sufficient force, torque, speed, range, etc.?
Has sufficient allowance been made for lost time?
Has proper allowance been made for off standard operation, such as operation on 50 or 25 cycle current, or the use of standard gear ratios or sheave diameters rather than theoretical values?
Has allowance been made for change in characteristics due to wear?
Has allowance been made for temperature change?
Are all elements and connections of adequate size?

Maintenance:

Do the units chosen have the degree of dependability warranted by the importance of their work?
Is their arrangement such that they are accessible for replacement or repair?
Is the oil system protected by adequate filters, coolers, cleaners, breathers, or temperature cut outs?
Is the oil reservoir provided with drainage facilities and a hand hole for cleaning?
Can the oil level be checked conveniently?
Is the equipment "fool" proof?
Is it rugged enough to stand the rough treatment which most industrial equipment sometimes gets?

Appearance:

Does the equipment "fit" the job?
Can it be arranged to produce a balanced, harmonious machine?

Don't Say Form Grind it . . . Say Radiform it

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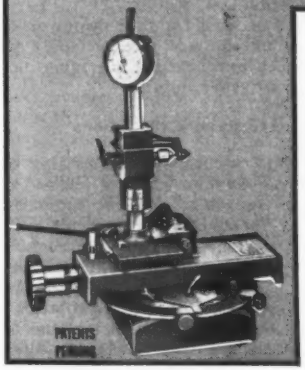

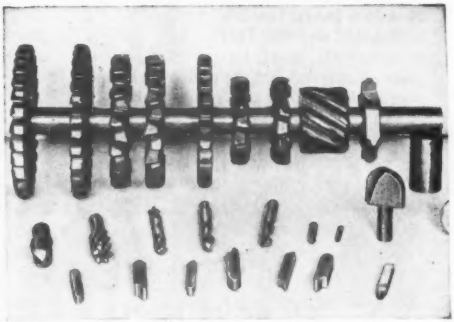

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Are connections and elements simple and can they be pleasantly arranged?

Cost:

Is the over-all cost, including installation, justified?

It is not until these and like questions can be answered in the affirmative that a fluid power circuit can be considered to be fully designed. While this may sound like a tremendous effort, it is really no more than is required for any other mechanical design. It is merely that when using a familiar design method many checks are unconsciously applied with a new method requiring close attention to every detail.

Hydraulic Calculations

Hydraulic calculations are nothing but mechanics. Anyone who has learned his mechanics can do any of the computing necessary for a hydraulic circuit. The computations most frequently required are those which convert given specifications into a form suitable for selecting the required units. Such a calculation is required, for instance, to determine the size of press required to make a specified press fit, but it is in no way a hydraulic calculation. Yet it is often necessary in order to select the proper hydraulic equipment.

The next important class of hydraulic calculations deals with the selection of sizes of pipes, valves, and passages to carry the fluid flow. This is a hydraulic calculation, but its basis is hydrodynamic which is classed as a branch of mechanics. Undoubtedly many of you are not skilled in hydrodynamics, but, fortunately, not much skill is required, as there are charts or rating tables, or nomograms available to assist in selecting the proper size of unit. It is only necessary to use reasonable discretion in establishing the permissible losses, and to make sufficient allowance for changing viscosity of the fluid.

The third class of computations is that which deals with establishing tolerances, setting limits, or selecting equipment to meet specific needs within required tolerances. Some discussion was

given before on this point, and considerable reliance must be placed on the equipment manufacturers' statements as to performance in this respect.

The fourth class deals with time and production figures. Strangely enough, this, in my opinion, comes closest to involving a hydraulic calculation. In many circuits the time required to store the energy required to stress the oil column is a factor. The elasticity or compressibility of oil is about ⅓% per 1000 psi if it is clear or solid. Most frequently it is somewhat aerated, and this, combined with other strains in the containing members, brings this factor up to a higher value. Perhaps ½% per 1000 psi is a good average value to use in this instance. This affects timing as it requires pumping to produce this stress. It also affects rigidity and can be used in determining the K factor.

Other calculations are of course required for designing hydraulic units. However, all such belong in the fields of mechanics, mechanisms, or machine designs. Since this is a paper on hydraulics no further point can be made by discussing such calculations.

Conclusion

In conclusion, a hydraulic power circuit is merely another mechanical element which has a few unfamiliar characteristics. The behavior of hydraulic elements must be studied to determine their performance in comparison with other power transmitting means, the favorable characteristics emphasized and the unfavorable ones minimized by proper selection of system, pressure range, type of control, and size of equipment, to produce performance most nearly matching the ideal. The particular characteristics which make hydraulic drives especially suited for many of these applications are their great flexibility, wide range, rugged construction, and built-in protection against overload. When all of these factors can be purchased in a few standard packages, and applied to a problem with only minor consideration, compared to the inconveniences of other transmission equipment, it is a method which cannot be dismissed without serious consideration.

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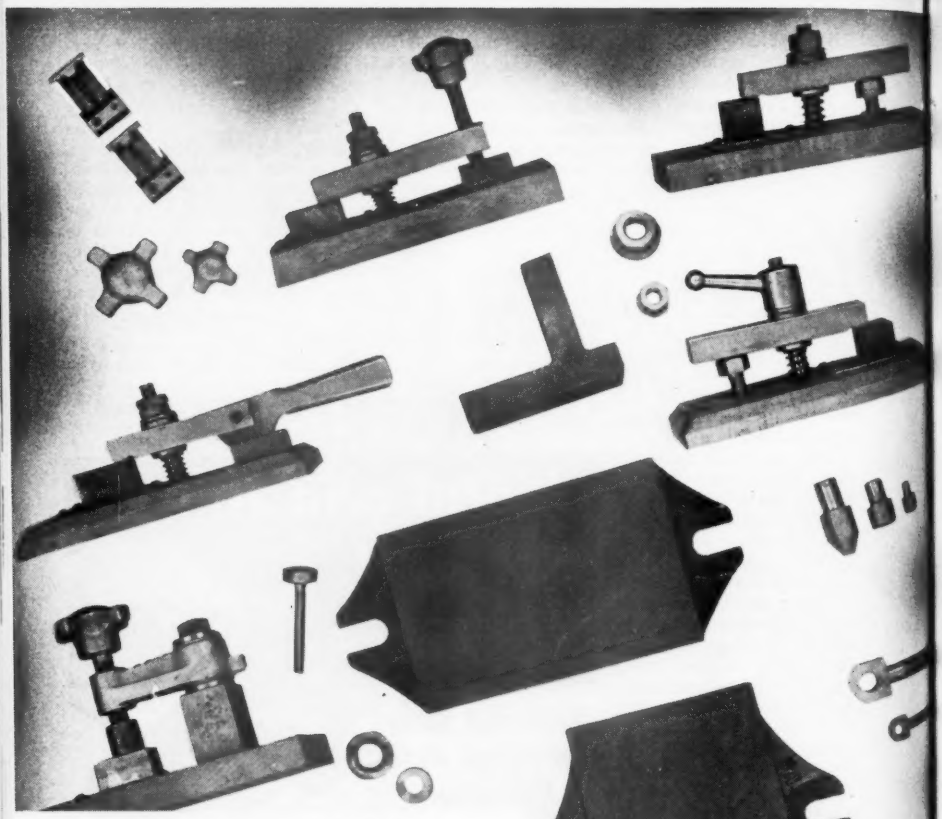

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Advances In Metallurgy During War

The Engineering Foundation has announced through Dr. A. B. Kinzel, Chairman of its Board, that advances in ferrous metallurgy made during the war will be recorded in a series of books to be published by the Alloys of Iron Research, a project of the Foundation. The first volume, in preparation now, under the direction of Frank T. Sisco, will contain a description of the characteristics and properties of the many new alloy steels developed during the war, and a summary of new principles of plastic deformations at elevated temperatures which have proved of value in developing new steels for high and low temperature use, as in jet-propelled airplanes that operate at high altitudes where temperatures are low.

Alloys of Iron Research is a major research project of the Foundation. The project was re-established a few months ago after a period of inactivity during the war. It was begun in 1930, with financial support from the Foundation and from major steel producers of the country, to review the important research work of the world on steel and to correlate the data thus obtained for the benefit of industries manufacturing or using steel. The results of this work were published in a series of 11 comprehensive monographs.

"The re-established project will continue this work on an even broader scale, made necessary by the remarkable advances that metallurgy has made during the war years," Mr. Sisco said. The first volume will contain a broad summary of the present status of ferrous metallurgy. There will be chapters on what might accurately be called the new science of metallurgy, including a precise understanding of the structural changes in the solid state that underlie our present knowledge of how steels harden when they are rapidly cooled, and how the hardenability of the various steels can be correlated with chemical composition.

Safety Research Institute Warning

To prevent accidents, many plants find it helpful to store organic solvents in a centrally located store room, with a responsible person in charge of issuing the liquids. Supervised distribution of solvents assists in avoiding fires, dermatitis or vapor poisoning which may be associated with the careless or improper handling of these chemicals.

One source of accidents which can be eliminated through such a method of solvent distribution is the use of unlabeled or incorrectly labeled solvent containers. Usually, drums of solvents are carefully labeled by the shipper, with information as to the nature of the contents and proper handling methods. With a supervisor in charge, it is possible to make certain that the label on every solvent container corresponds to the label on the drum from which the solvent is obtained.

The use of a requisitioning procedure has been found useful in a number of respects. The requisition form contains a statement of the purpose for which the solvent is needed. In this way, misuse and unauthorized use of solvents are avoided. A regular tally of requisitions indicates those departments which employ relatively large quantities of solvents and which therefore require

careful checking from the safety viewpoint. Requisitioning also prevents waste, and provides a check when solvent consumption seems excessive.

Seek Books, Funds For War-Damaged Technical Libraries

An effort to help restore war-damaged or destroyed technical libraries in Europe, Asia and the Philippines is being made by the Committee on International Relations of the Engineers Joint Council. Money for the purchase of new books and selected used technical books and periodicals, are both included in the appeal made to engineers all over the United States. Started about a year ago, the campaign has been responsible for the shipping of 4,592 engineering books; 9,526 periodical items; 5,423 bound volumes of society transactions.

Donors of books will be furnished with bookplates with space to enter their names. This original bookplate bears the insignia of the five national societies of the Engineers Joint Council: ASCE, AIMME, ASME, AIEE and AICE.

All offers of books (containing lists by author and title) and checks should be sent to Joseph Pope, Chairman of the Book Commission, Engineers Joint Council, 29 West 39th St., New York 18, N. Y. Books should not be shipped, however, until full instructions are received. Any further questions will be answered upon request by Mr. Pope.

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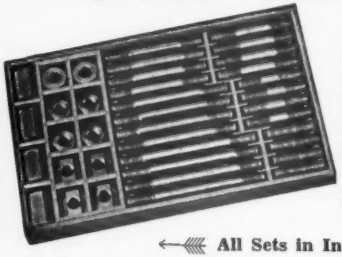

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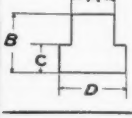

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U. S. First To Ratify 25 Nation ISO

The United States was the first country to ratify the convention setting up the 25 nation International Organization for Standardization (ISO), P. G. Agnew, vice president and secretary of the American Standards Association recently announced.

After four international meetings covering a year, a solid basis of agreement was reached interpreting the part which international standards can play in establishing freer flowing trade channels. Supplementing the work done by engineering groups in pioneering international standards, organized industry is now taking an active and interested part in all countries; not only those which

are highly industrialized, but also in those which are using standards as a tool to speed their full entrance into the modern industrial world.

Pressure for standardization work which will aid the flow of goods in international trade has been so great, Dr. Agnew said, that a growing number of projects are being planned for ISO action. Seventeen nations have accepted the technical leadership in forwarding one or more of 64 projects; in each case technical leadership is taken by a country well developed in the industry concerned.

These include: metal food containers, iron, steel, rubber (United Kingdom); methods of testing petroleum products, agricultural machinery, still photography, moving pictures, definition of the term "rayon" (USA); timber grading and classification of defects, surface finish of metal surfaces (USSR); metric and inch threads, ball and roller bearings, modular building planning (Sweden); bolts and nuts (Poland); sheet and wire gages (Australia); gears, couplings, commercial zinc (Belgium); nonmetallic packaging of frozen food (Norway); limits and fits, tools, automobiles, machine tools, tests for building materials (France); aircraft and airfield lighting, copper and copper alloys (Canada); ocean navigation, pigments, raw materials for paints, rivets (Holland); pipes (Switzerland); shellac, mica (India); methods of analysis of essential oils (Brazil); sprinkler plants (Austria).

Stevens Studies Iron Powders

To improve industrial metal powder techniques, a special project is being carried out by the Stevens Institute of Technology, Hoboken, N. J., under the sponsorship of the OTS Industrial Research and Development Div., U. S. Dept. of Commerce. Stevens Institute will study particle size, sintering methods, chemical composition, density, etc., in order to determine factors affecting the physical properties most suitable for widespread industrial application of powder metallurgy. Later OTS will issue a full report of their findings.

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purchase of manufacturing and sales rights of the State Boring and Reaming Tool and allied products. These tools are now being produced in the East Shore Factory, well known for years of manufacture of precision automotive parts, the Glenny Broach, etc.

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The modern replacement tool for fixed center drills—greatly reducing cost per hole.

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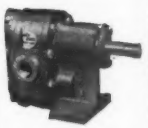

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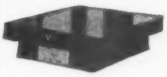

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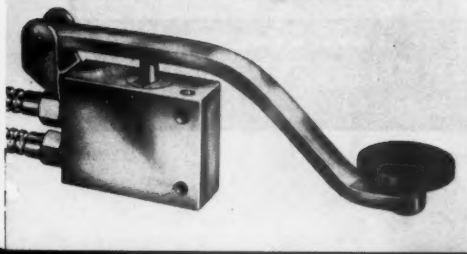


FOR FURTHER INFORMATION FILL IN KEY NUMBERS ON POSTAGE-FREE INFORM-A-GRAM INSERT

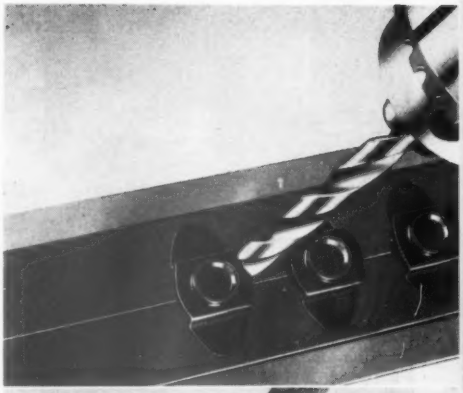
TAPPING HOLES AS CLOSE AS 15/16THS CENTER TO CENTER is possible with the new positive drive Tool-Flex tool holder recently announced by the Burg Tool Mfg. Co. Utilizing Acme-threaded shanks for use on multiple-spindle tapping operations, this new tool holder has only four parts; the shank, collet, locking ring and a full-floating oil-resistant Neoprene mounting which minimizes tap breakage, compensates for misalignment and eliminates bell-mouthing and oversized holes. Secure other details from BURG TOOL MFG. CO., Dept. 7, 5028 W. Jefferson Blvd., Los Angeles 16, Calif., or use INFORM-A-GRAM Key No. G7-W.

QUICKLY AND ECONOMICALLY CONVERTING JIG BORERS and other machine tools into precision jig grinders, the high-speed air-driven Vulcanaire has been perfected by the Vulcan Tool Co. to meet a need for just such an adaptor. Precision grinding holes from $\frac{1}{8}$" to 1$\frac{1}{2}$" is possible. Inexpensive, the complete unit includes an adaptor to fit any specific machine tool, together with dust collector, air filter, pressure gauge and oiler. The Vulcanaire is also produced in models for adapting lathes, milling machines and internal and surface grinders for other high speed precision grinding. Request full details from VULCAN TOOL CO., Dept. 75, Dayton, Ohio, or use INFORM-A-GRAM Key No. K75-W.

SENSITIVE, NEAT AND COMPACT, the new precision-built three-way Mead fingertip valve acts as quickly as a telegraph key to operate cylinders up to a 4" bore or more. Easily attached to either vertical or horizontal surfaces, this valve is also recommended for cam operation, whereby an automatic cycle can be set up for many types of work to save time, reduce fatigue and increase operational safety. Get more information concerning this fingertip valve by writing to MEAD SPECIALTIES CO., Dept. 5-69, Chicago, Ill., or use INFORM-A-GRAM Key No. 569-W.

ON PARADE

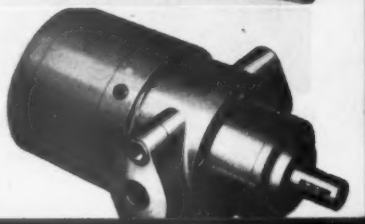
PERMITTING A SAVING IN MAN HOURS OF UP TO 75% in lofting and tool making time, the new type drill-jig "Anchor Bushing" includes a formed steel anchor into which is pressed a hardened steel bushing. This Anchor Bushing can be quickly spot-welded to any flat or curved template and does not require a heavy fixture. Because of their low cost and complete flexibility, these bushings make production tooling worthwhile for small jobs where only hand drilling seems justified. They are equally adaptable for precision drilling on mass reproduction jobs. Additional data may be requested from HI-SHEAR RIVET CO., Dept. 76, 1559 Sepulveda Blvd., Hermosa Beach, Calif., or use INFORM-A-GRAM Key No. K76-W.



IMPRINTING LETTERS, NUMBERS, etc., on finish machined metal parts, the new automatic roll marker from NEW METHOD STEEL STAMPS, INC., may be used for either right- or left-handed operation. This roll marker employs prelubricated ball bearings (sealed-in to prevent scoring from chips) for the roller die shaft, enabling more pressure to be exerted on the work. Additional information may be requested from the manufacturer, Dept. 1-22, 147 Jos Campau, Detroit 7, Mich., or use INFORM-A-GRAM Key No. 122-W.

HANDLING GEAR CUTTING UP TO 2¼" PITCH DIAMETER with a 2" length cut, the new Waltham Pinion and Gear Cutting Machine fills the needs not met by the available Waltham 1½" or 4" machines. Completely automatic, this machine employs a single revolving cutter which makes successive cuts on blanks held and indexed by the work spindle, and supported by tail center. Further material may be requested from WALTHAM MACHINE WORKS, Dept. 5-14, Waltham, Mass., or use INFORM-A-GRAM Key No. 514-W.

COMBINING QUIET OPERATION WITH HIGH PRESSURE and high volume, the new Series 3500 Denison Hydroilic Fluid Pump is revolutionary in design; includes fewer parts, a two-piece shaft, a pressure balanced piston shoe and a simplified operating principle. It costs little, is highly efficient and takes little space. Get an eight-page well-illustrated explanatory booklet from DENISON ENGINEERING CO., Dept. 2-60, Columbus 16, Ohio, or use INFORM-A-GRAM Key No. 260-W.



ADAPTABLE FOR BOTH MANUAL AND HOPPER FEEDS an automatic inspection system for small parts is now being offered to private industry by the Arma Corp. The inspection system is an electronic light-indicating comparator with automatic classification

of parts up to 1½" maximum size. This equipment inspects, counts and sorts parts and places them in good and rejected groups, meeting the needs of every type of industry. Send for additional data to ARMA CORP., Dept. 79, Brooklyn, N. Y., or use INFORM-A-GRAM Key No. K79-W.

AUTOMATIC POSITIONING, clamping and feeding are all done with a single control lever on the high production center drilling machine manufactured by Detroit Tap and Tool Co. Concentric centering is simply done by even inexperienced operators, using all

shapes of stock ranging from ⅛" to 2⅜" outside diameter. The drill operates at 1250, 2400, or 5200 rpm. Other information may be requested from DETROIT TAP & TOOL CO., Dept. 34, 8432 Butler Ave., Detroit 11, Mich., or use INFORM-A-GRAM Key No. 34-W.

SHEARING EVENLY THE FULL LENGTH of its cutting edge, the newly patented Helical Cutter end mill features a progressive spiral taper which maintains a constant helical angle through the cutting edge. Rendering fast and free cutting and shearing action, this spiral end mill is made of selected H.S. tool steel with flutes polished out. It is easily

faced and sharpened. Further data may be requested from HELICAL CUTTER CO., Dept. 50, 5536 Telegraph Rd., Detroit 23, Mich., or use INFORM-A-GRAM Key No. K59-W.

EASILY AND QUICKLY ATTACHED to hand fed drill presses the Copilot Cutting Tool Feed Regulator predetermines the maximum safe feeding rate and limits operation to that rate. Eliminating practically all drill breakage it

permits maximum rate of production consistent with acceptable work. It prevents violent contact of drill with work at start of operation.

A NEW TOOL THAT DOES A HARD JOB

..THE EASY WAY!

PERSSON

DIE JACK

PATENT APPLIED FOR

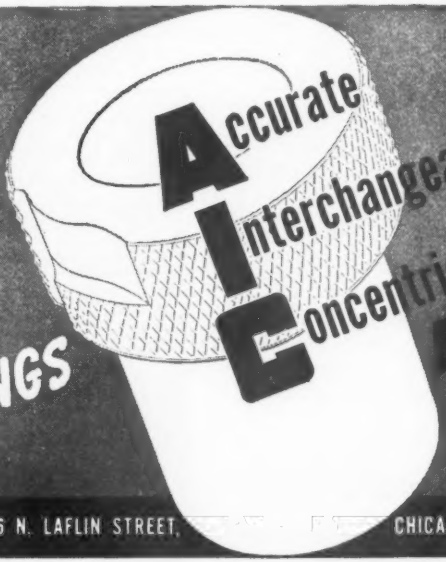
Here, at last, is a new tool designed to separate die sets . . . avoids makeshift prying or hammering methods. Jack is simply clamped on and handle turned to elevate or lower punch holder rapidly or slowly. A precision tool, accurately machined of finest steel and alloys.

NO PRYING • NO HAMMERING
NO DAMAGE • NO INJURY • NO DELAYS

PERSSON MFG. COMPANY, 2 HENRY ST., BLOOMFIELD 4, N. J.

WRITE FOR FREE CATALOG

DRILL JIG BUSHINGS



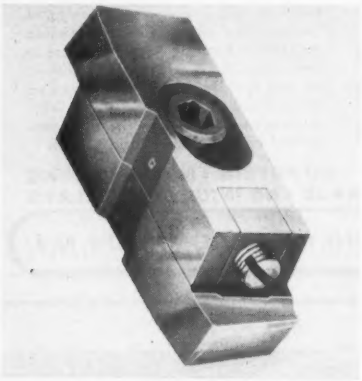
Accurate Interchangeable Concentric

Acme Industrial Company

206 N. LAFLIN STREET, CHICAGO 7, ILLINOIS

An unskilled operator will produce good work from the start as the Copilot permits free action for chip clearing and checks downward motions of drill before contact is again made with bottom of hole. Complete details are available from EDSON ENGINEERING CO., Dept. 49, 219 Main St., Boonton, N. J., or use INFORM-A-GRAM Key No. J49-W.

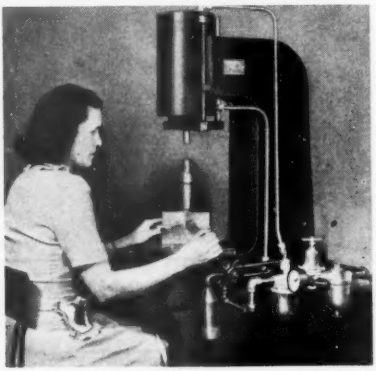
HIGHLY ADAPTABLE TO BOTH PRODUCTION AND JOBBING SHOP OPERATIONS, the new Madison Rough Boring Tool features cutting blades which form their own cutting block. Quick changing of cutters, cutter size



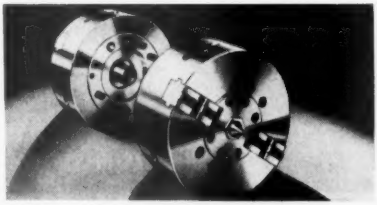
adjustment before mounting, and positive centering are advantages of this new tool. Turning a micrometer thread screw will expand the blades equally from the centering slot to make up for wear and regrinding. Descriptive literature may be requested from MADISON MANUFACTURING CO., Dept. 8-19, Spring & Bauer Streets, Muskegon, Mich., or use INFORM-A-GRAM Key No. 819-W.

PERMITTING A WIDER OPERATING RANGE and easier handling, the Weldit Welding Torch W-46 now offers a full "handle length" lever by which the gas is controlled with only finger-tip pressure, and a built-in Automatic Gasaver which has shown a gas saving of as much as $4.80 per man per day. Production has been jumped 100% and more in plants using this torch and gas waste eliminated 2/3rds. Inquiries may be directed to WELDIT, INC., Dept. 100, 990 Oakman Blvd., Detroit 6, Mich., or use INFORM-A-GRAM Key No. K72-W.

GIVING UP TO 200 SHARP PUNCH PRESS RAM BLOWS PER MINUTE or when desired regulated to a slow squeezing action, two new air-powered all steel welded construction arbor presses, the Hurricane six and the Hurricane eight, are announced by the Studebaker Machine Co. These presses are especially suited for light push or pull broaching jobs as well as for fast assembling, stamping, forming, riveting, punching and other punch press operations. Detailed information is available upon request from STUDEBAKER MACHINE CO., Dept. 4-77, 1221 S. 9th Ave., Maywood, Ill., or use INFORM-A-GRAM Key No. 477-W.



DESIGNED TO DRIVE WORK ON CENTERS where exceptionally heavy cuts are being taken with carbide-tipped tools at high spindle speeds, the two-jaw compensating Skinner power chuck, Series 23100-A, easily grips rough-forged or cast surfaces. Sturdy and rigid in every detail, this chuck is machined of the finest steel forging and alloy steels with critical surfaces held to very fine toler-



TU-MY-CO

TRADE TUMICO MARK

VERNIER CALIPERS

Made for LASTING DEPENDABILITY

Graduations and numerals applied by a new scientific acid etching process to a depth of .002, assuring a degree of accuracy and permanency heretofore unknown in tools of this type. See illustration below.

Graduated on both sides in English—one side for outside measurements, the other for inside measurements.

No. 75 SERIES—4 sizes—6, 12, 24 and 36-inch—length of jaws 1¼", 2⅜" and 3" on the two larger sizes. Sold with or without case. ASK YOUR JOBBER.

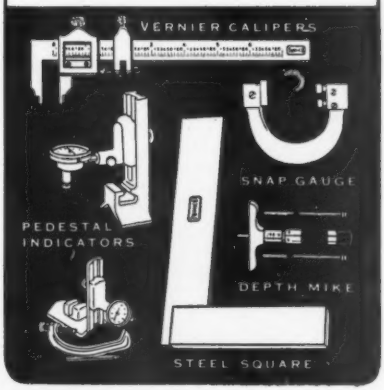
Precision is a TU-MI-CO Tradition

WRITE FOR BULLETIN TD-V

TUBULAR MICROMETER CO.

ST. JAMES, MINNESOTA, U. S. A.

Milwaukee Branch • Plankinton Bldg.



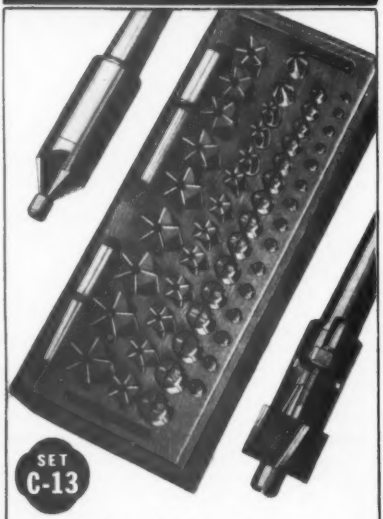
For heavy duty counterboring requiring rigidity, strength and perfect alignment, choose Gairing's type C. The handy kit shown below, gives you a wide range of cutter and pilot combinations.

COUNTERBORE SETS

Write for Folder and Prices

THE GAIRING TOOL CO.

Roosevelt Park Box 478 Detroit 32 Mich

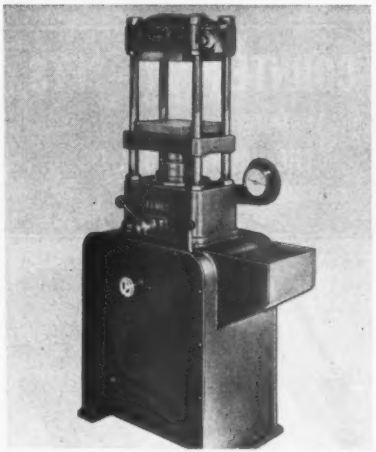


Sturdy box with hinged cover contains: holders C-12 and C-13; 20 cutters from 9/16" to 1¾"; 28 pilots from 9/32" to 1⅛" and two ⅛" countersinks, one 70° and one 82°.

GAIRING TOOLS

ances. Easy removal of the center without disturbing the center plate is possible by means of a single thin nut. Specifications may be obtained from SKINNER CHUCK CO., Dept. 69, New Britain, Conn., or use INFORM-A-GRAM Key No. F69-W.

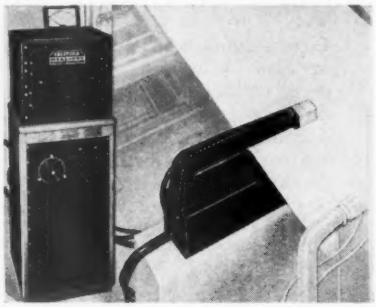
OPERATED ON A HYDRAULIC PRINCIPLE, a new line of high production, fully power-operated presses that have neither motor nor pump, has been announced by Elmes Engi-



neering Works. Simple design, negligible air requirements, as well as low first cost, operation and maintenance, are combined in light-weight, compact press construction. For complete details on these 20- and 30-ton bench-type and 50-ton floor-type models, write ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, Dept. 78, 1002 Fulton St., Chicago 7, Ill., or use INFORM-A-GRAM Key No. K78-W.

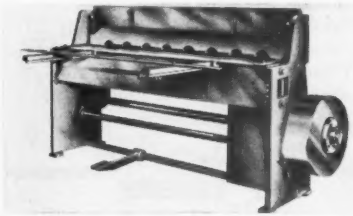
SHEARING AND TRIMMING OPERATIONS of all kinds up to 14-gauge capacity can be handled by the new Parker Power Squaring Shears. Of extra heavy steel plate, welded and normalized to relieve stresses, these shears are only 47" high, give smooth vibrationless operation, and average about 85 strokes per minute. Request other material from PARKER MANUFACTURING CO., Dept. 53, 2200 Colorado Ave., Santa Monica, Calif., or use INFORM-A-GRAM Key No. K53-W.

UTILIZING AN ENTIRELY NEW X-RAY AND ELECTRONIC APPLICATION for non-contact, continuous or spot checking of thickness of all types of moving materials is featured in Sheffield's new Measuray. This gaging in-



strument can be applied to almost any production process for measuring and regulating thickness of material. Four standard units are available to be used for determining thickness, density and type of material, as well as tolerances to be checked. Complete details are available from the SHEFFIELD CORP., Dept. 24, Dayton 1, Ohio, or use INFORM-A-GRAM Key No. 24-W.

INTRODUCING IMPROVED BEARING SEALS, rear V-belt drive, motor mounting and settling chamber with easily controlled self-priming pump, the new line of Hisey wet grinders is available in double end, single



Mac-it ALLOY STEEL SCREWS

Get EXTRA strength on EXTRA TOUGH JOBS with SQUARE HEAD SET SCREWS!

Mac-it Quality Square Head Set Screws have extra resistance and strength on jobs where they must take terrific punishment. No upsetting or mushrooming of points, no breaking off under the head. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY

STRONG, CARLISLE & HAMMOND COMPANY

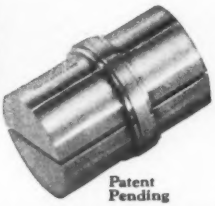
CLEVELAND 13, OHIO

MANUFACTURED BY

MAC-IT PARTS COMPANY LANCASTER, PA

ASCO "AUTO-ARB" *can triple production on many secondary operations*

Automatically Expanding Arbor for holding work piece by inside diameter while machining outside surfaces.



Patent Pending

PERMITS CHUCKING and UNCHUCKING *WITHOUT STOPPING SPINDLE!*

Any machinable part can be held firmly by the inside diameter, for secondary operations, with the ASCO "AUTO-ARB". "AUTO-ARB" is a precision tool, expanding accurately, and maintaining perfect concentricity with the collet. No other tools are necessary—chucking and unchucking can be done without stopping the machine. Works equally well in "blind" holes, and requires a minimum of holding surface—eliminating the need for special arbors. Can also be used on drill presses or milling machines with collet devices.

Auto-Arb is available in range of standard sizes, from ⅜" to 1½", at 1/64" intervals. Only 5 collet sizes are required to accommodate this range. Larger sizes available on special order.

Auto-Arb has been proved by production tests—more than tripling production and eliminating downtime of machines. No failures have been reported from the hundreds already in actual service.

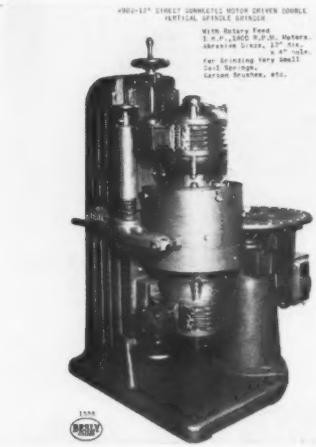
Write for descriptive Bulletin

THE ASCO CORPORATION

17704 WATERLOO ROAD • CLEVELAND 19, OHIO

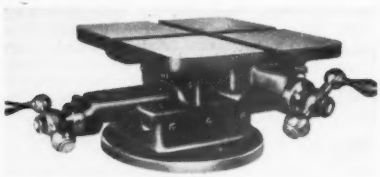
and combination wet and dry models. Grinding wheels are in 10, 12, 14, 18, 20, 24 and 30 inch sizes. Make inquiries to HISEY-WOLF MACHINE CO., Dept. 5-42, Cincinnati 25, Ohio, or use INFORM-A-GRAM Key No. 542-W.

DESIGNED FOR HIGH OUTPUT ON SMALL PARTS, the new No. 902 Double Vertical Spindle Grinder introduced by Charles H. Besly & Co. features a horizontal rotary feed



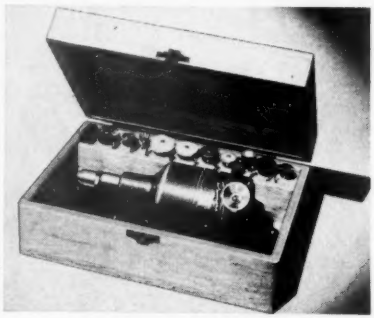
which permits rapid and accurate dropping of small parts into the feed wheel. It is applicable for grinding steel rollers, carbon brushes, washers and small pieces within allowable tolerances; will grind up to 4000 small coil springs per hour. Write CHARLES H. BESLY & CO., Dept. 9-15, Chicago, Ill., or use INFORM-A-GRAM Key No. 915-W.

PRECISION BUILT, the new Brown 2-way sliding table is accurately gaged to travel in each direction. Quickly mounted on any drill press, this table is 7½" square and



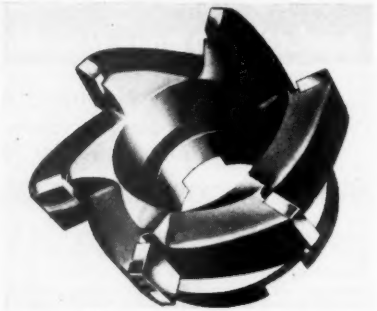
fitted for 1" T-Bolt heads; weighs only 24 pounds. Direct inquiries to LEO G. BROWN ENGINEERING CO., Dept. 38, 1127 Riverside Dr., Los Angeles 31, Calif., or use INFORM-A-GRAM Key No. J38-W.

USABLE EITHER AS A STRAIGHT HAND-GRINDER or with an attachment which converts it to a flexible shaft tool, the new electric Duplex handgrinder uses three standard



sizes of mounted tools to sand, sharpen, grind, saw, drill and polish. It is driven by a full 1/14 hp motor equipped with "long life" sleeve bearings. Get other specifications from the DUMORE CO., Dept. 5-61, Racine, Wis., or use INFORM-A-GRAM Key No. 561-W

NOW AVAILABLE IS THE NEW LINE of Red Streak Carbide Tipped and Blue Streak Tantung Tipped Shell End Mills, manufac-



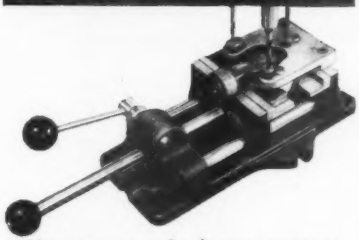
tured by the Vascoloy-Ramet Corp. Both right- and left-hand styles are stocked in sizes from 2½" OD to 4½" OD and bores 1" to 1½". They have negative radial and axial rake angles for milling steel and zero rakes for milling cast iron, non-ferrous and non-metallic materials. Get other data from VASCOLOY-RAMET CORP., Dept. 25, North Chicago, Ill., or use INFORM-A-GRAM Key No. 25-W.

PORTABLE MEASUREMENT OF HARDNESS with applied screw action is obtained by the

USE WORLD'S FASTEST VISE

CUT COSTS UP TO 75%

ON JIGS AND FIXTURES



You can stop the heavy expense and time losses common in the building of special jigs for drilling and light milling operations. Use the Heinrich "Grip-Master" as a base-structure. Built-in bosses and removable parallels permit easy attachment of bushing plates and locating jaws. You can speed up loading and unloading unbelievably, thanks to the large jaw openings of the "Grip-Master" and its revolutionary *screwless* feature.

WRITE FOR FULL FACTS!

Ask your Mill Supply Dealer about the Heinrich "Grip-Master." If he does not yet have a stock, write for folder that fully illustrates and describes the money saving uses of this amazing tool.

HEINRICH

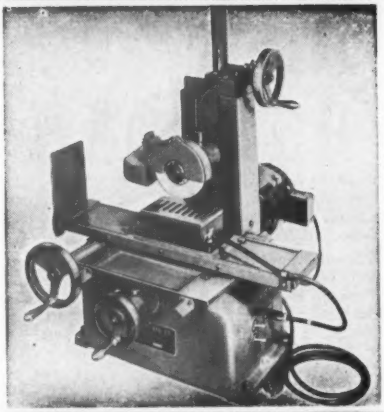
Grip-Master

DRILL PRESS TYPE SCREWLESS VISE

NATIONAL MACHINE TOOL CO.

DEPT. 137-D, RACINE, WISCONSIN

SANFORD



High-Speed **BENCH**

SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

WRITE FOR BULLETIN

SANFORD MFG. CO.

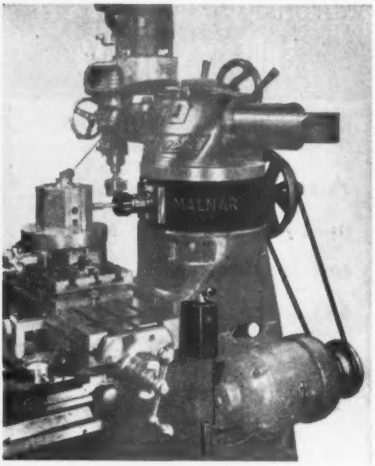
1020-28 Commerce St.

Union, N. J.

Ames Portable Hardness Tester which employs a diamond point penetrator in the Rockwell "C" scale and a ball point penetrator in the "B" scale. Pressure is rendered with

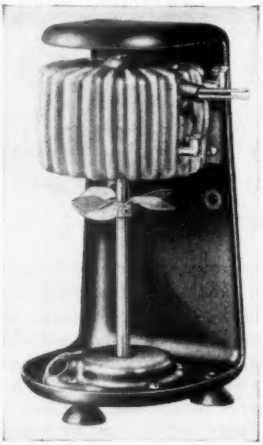
a hand wheel in kilogram loads which gradually spring the stainless steel C frame and transmit the readings to the dial indicator. Get other information from AMES PRECISION MACHINE WORKS, Dept. 51, Waltham 54, Mass., or use INFORM-A-GRAM Key No. K51-W.

ELIMINATING COSTLY ERRORS DUE TO RESETTING Bridgeport Turret Milling Machines from vertical to horizontal, the Malnar



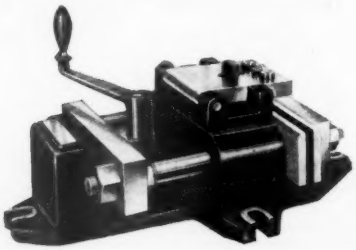
Horizontal Unit enables all jobs to be done on one setup. Capable of handling heavy end milling, fly cutting, boring, drilling and other minor operations, the Malnar runs vibration-free on Timken Roller Bearings. Explanatory catalog, TD-1, will be sent upon request from MALNAR MACHINE & TOOL CO., INC., Dept. 50, 19301 St. Clair Ave., Cleveland 10, Ohio, or use INFORM-A-GRAM Key No. K50-W.

APPLICABLE ON MANY DIVERSIFIED JOBS, the Morey Pump has ample capacity for the smallest to the largest evaporative cooler and is equally effective for circulating coolants,



spot welding, and for all light industrial uses where small pumps are required. The unit is 10 inches high; weighs 7 pounds. Ask for additional data from DAN MOREY, Dept. 36, 814-16 South Robertson Blvd., Los Angeles 35, Calif., or use INFORM-A-GRAM Key No. K36-W.

THE COST OF MILLING AND DRILLING OPERATIONS CAN BE CUT in the Production Dept. with the quick-acting Downing Universal-Combination Milling and Drilling Vise. It clamps with a single arm stroke and can be



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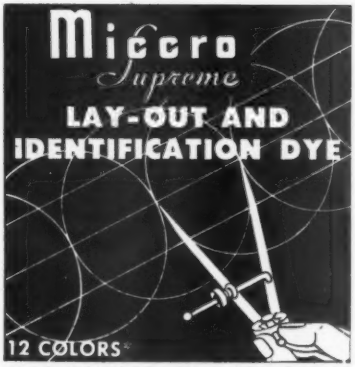

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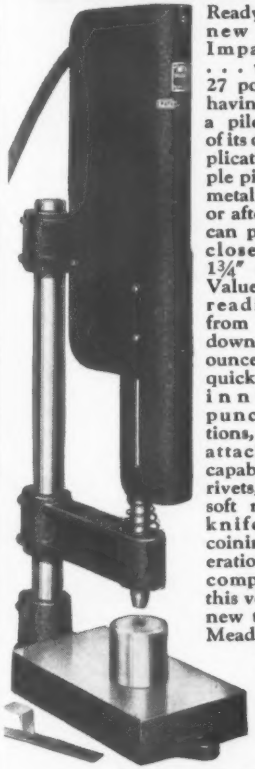
Announcing the

MEAD *Impact* AIR HAMMER



Ready . . . Mead's new air-powered Impact Hammer . . . weighing only 27 pounds . . . yet having a wallop like a pile-driver! One of its outstanding applications is multiple piercing of large metal sheets before or after forming. It can punch holes as close together as 1¾" on centers. Value of the impact readily adjusted from 4,500 pounds down to only a few ounces. Set-ups are quick, easy. Besides innumerable punching operations, with suitable attachments it is capable of upsetting rivets, blanking out soft materials with knife dies, light coining, forging operations, etc. Get complete facts on this versatile, handy new tool and other Mead Air Power devices. Write for Catalog.

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DEPT. HA-47
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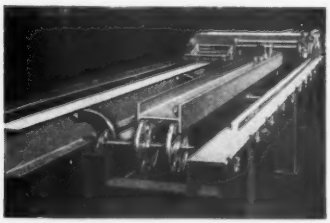
converted into a drilling jig by removing keys and adding jig lid bracket and the correct jig lid for part. Rigid construction, accurate location, speed of operation, precision in manufacture and ample chip clearance are some outstanding features listed in literature available by writing DOWNING ENGINEERING COMPANY, Dept. 56, 4005 S. Smithville Rd., Dayton, Ohio, or use INFORM-A-GRAM Key No. K56-W.

MECHANICALLY FINISHING AND DE-BURRING very small parts efficiently in large or small quantities to net greater time and labor economies, the new Roto-Finish Midget-size

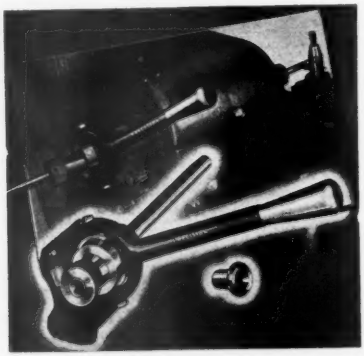
machine is especially suitable for installation in small plating shops and manufacturing plants with small finishing departments. The cylinders of the Roto-Finish Midget are 8" wide, 12" across the flats; it has a variable drive of 35 to 70 rpm. Request more details from THE STURGIS PRODUCTS CO., Dept. 17, Sturgis, Mich., or use INFORM-A-GRAM Key No. C17-W.

HANDLING I-BEAMS OF VARYING SIZES and weights for flange punching without special adjustments, the new simplified Beatty Spacing Table carries the beam on the under-



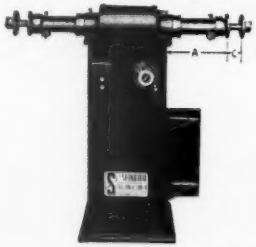
side of the top flange, which regardless of the size or weight of the beam, is always at die level and freely passes over the dies. An air cylinder easily controls the arm carrying the rolls for placing the beam on the table. Top flange of the beam is gripped by the spacing table carriage for movement during the punching operation. Additional material may be requested from BEATTY MACHINE & MFG. CO., Dept. 49, Hammond, Indiana, or use INFORM-A-GRAM Key No. H49-W.

DESIGNED FOR PRODUCTION USE ON HALF-INCH collet capacity lathes, the new improved Precision Lever-type Drawbar features three ranges of tension adjustment,



offers positive gripping, and will automatically fit to stock diameter regardless of any slight variation. Lessening operator fatigue, this tool is recommended for use by women operators. This drawbar is rugged, though simply built; it employs a special co-ordinate cam principle to reduce friction and eliminate the need for fingers. Get other information from GENERAL DIE & STAMPING CO., Dept. 7-06, 262-272 Mott St., New York 12, N. Y., or use INFORM-A-GRAM Key No. 706-W.

REDESIGNED FOR GREATER EFFICIENCY and convenience, the 2 HP and 3 HP Infinitely Variable Speed Buffing and Polishing Machine manufactured by the Standard



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YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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Do you need a vise of ANY type?

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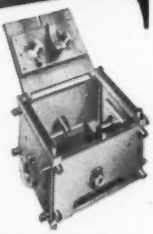
NEW *Drillet* JIG BOX

CUTS DRILL JIG COSTS 75%

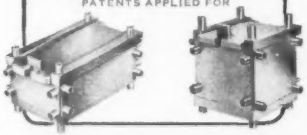
DOES AWAY WITH SPECIAL TOOL DESIGN OF THE JIG BODY



Casting Machined by using standard Drillet Jig Box

BUILT IN STANDARD SIZES AND SHAPES UP TO 6" x 6" x 6"

PATENTS APPLIED FOR



The Drillet Jig Box is a six sided leaf type jig for all phases of drill press operation. Tooling expense can be reduced as much as 75%. All that is necessary is for toolmaker to locate part and insert drill bushings. Eliminates preliminary steps required in building and squaring jig. Side plates, end plates and leaves are replaceable for immediate delivery. Before investing hundreds of dollars in your toolmaker's time —Write for Literature and Prices.

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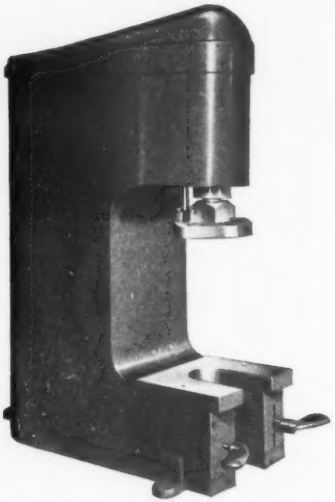
Electrical Tool Co. is available with an enclosed spindle construction, four ball bearings, sight feed oil gauge on each bearing housing and shaft lock, or with an exposed spindle. Its ball bearing motor is enclosed, and on an adjustable base. Spindle speeds between 1500 and 3000 rpm are obtained instantly upon turning the "Speedial" control. Other specifications may be requested from THE STANDARD ELECTRICAL TOOL CO., Dept. 4-70, Mt. Hope & Sixth Sts., Cincinnati 4, Ohio, or use INFORM-A-GRAM Key No. 470-W.

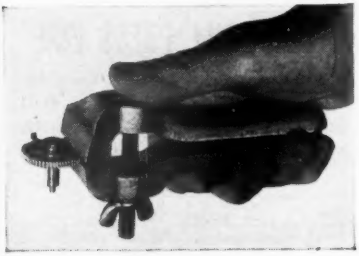
SMALL ENOUGH FOR THE LIGHTEST PRESS job, yet powerful enough for operations done by machines five times its weight, the new 5-ton Air-Hydraulic Press is constructed simply and well with no intricate assemblies or temperamental gadgets to get out of order. Equipped with a 4-way balanced valve for easy operation and positive control, the Bryant unit is versatile and highly efficient for straightening, broaching, stamping, forming, bending, cutting and many punching operations on a wide variety of materials. A descriptive folder can be obtained by writing to BRYANT PRODUCTS CO., Dept. 73, Jackson, Mich., or use INFORM-A-GRAM Key No. K73-W.



RENDERING UNCHANGING FACILITY OF OPERATION for tapping jobs ranging from soap to copper or chrome nickel steel, with little or no increase in fingertip pressure, ultra-sensitive Torqomatics are available in

three sizes, standard or built-in, and can be furnished to fit any drill press or tapping machine. Precision made of finest materials, these torque-driven devices are described in full detail in an eight-page folder which may be requested from THE CHARLES L. JARVIS CO., Dept. 10, Middletown, Conn., or use INFORM-A-GRAM Key No. K74-W.

SOLIDLY GRIPPING WITHOUT MARRING OR SCRATCHING the work, the new Palmgren No. 15 aluminum hand vise announced by Chicago Tool and Engineering Co. makes



handling of small parts easier and safer for both bench and production jobs. Light and comfortable to hold, this "velvet grip" vise weighs only 7 oz., is 5" long, and has 1½" wide jaw faces which open to 1½". Full description of this new vise is in Bulletin No. 150 which is available from CHICAGO TOOL & ENGINEERING CO., Dept. 5-91, 8383 S. Chicago Ave., Chicago 17, Ill., or use INFORM-A-GRAM Key No. 591-W.

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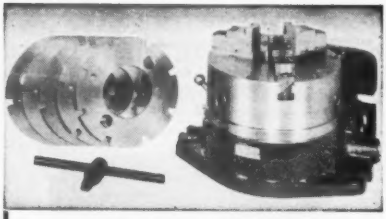

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So many different jobs can be done more economically with the Hartford Super-Spacer that it will pay you to investigate its possibilities for your shop. Standard equipment includes mask plates, reversible jaw self-centering chuck, sliding handle chuck wrench. It's moderate in cost. Write for illustrated applications bulletin.

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NOW EVANS OFFERS YOU • • •

NEW SPEED and ACCURACY WITH MICROLEX ANTI-FRICTION DIE SETS • • •

Microlex Die Sets have ball or roller bearing guide pins which reduce die setter's time . . . enable you to get into production quicker . . . permit fast press speeds. Microlex Die Sets eliminate all down time caused by bound, scored or galled pins. Bearings have pre-load to prevent play between guide pins and bushings.
You don't have to wait to cash in on the profitable advantages offered by Microlex Die Sets. A large number of sizes are ready for immediate shipment.

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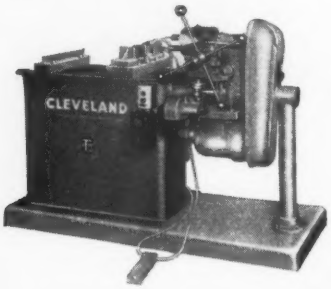
OFFERING UNUSUAL EFFICIENCY AND ECONOMY a new metal melting furnace, the Johnson 616, will melt 600 pounds of lead in 29 minutes. It is equipped with 6 atmospheric

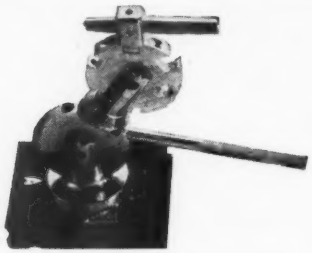
fired Johnson Direct Jet bunsen burners each having independent shut-off valve and pilot light. Pot temperatures are held at working levels with 3 burners, permitting substantial savings in melting lead, babbitt, tin, zinc, aluminum and type metals. Write to JOHNSON GAS APPLIANCE CO., Dept. 6-05, 575 E Ave., N.W., Cedar Rapids, Iowa, or use INFORM-A-GRAM Key No. 605-W.

SUITABLE FOR A WIDE VARIETY OF APPLICATIONS in drilling and tapping long and irregular-shaped workpieces, the new Horizontal Combination Drilling and Tapping Machine developed by CLEVELAND TAPPING MACHINE CO. incorporates new and interesting features. The head is indexed by hand



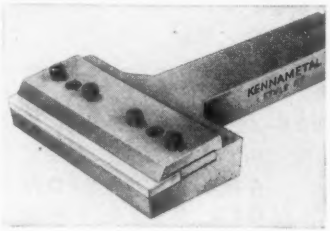
control for consecutive drilling and tapping; the depth of hole and withdrawal of the tool are controlled automatically. An air-operated vise, standard equipment, holds the workpiece or may be specially attached to function with an air-operated cross-slide for drilling and tapping at several pre-determined points. For other information, write to the manufacturer, Dept. 2-42, Hartville, Ohio, or use INFORM-A-GRAM Key No. 242-W.

OFFERING ACCURACY EQUAL TO ANY HEIGHT GAGE, the Gem-Flex, new tool and wheel dressing fixture is extremely versatile

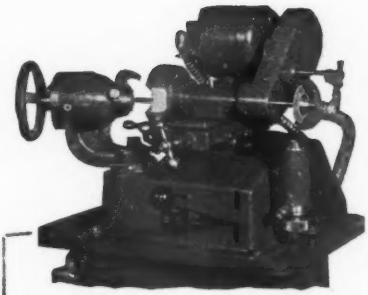


in shaping, drilling, grinding, milling, or gaging operations. Capable of forming any angle in addition to a number of inside and outside radii, the Gem-Flex can serve as a flexible indicator stand, a surface gage, and to form tool bits, thread chasers and small dies. Get additional data from ALLIED MACHINISTS, Dept. 67, 6 Water St., Waltham, Mass., or use INFORM-A-GRAM Key No. K67-W.

TURNING CAST IRON ROLLS UP TO 90 SCLEROSCOPE with Kennametal broad-nose roll turning tools reduce production costs. The



blade has four cutting edges that may be used in succession before any sharpening is required, then reground time and again and advanced to cutting position, until ⅔ of the blade has been utilized. Write for full particulars on these tools available in four standard widths 4", 6", 8", and 10". Request catalog 47 from KENNAMETAL, INC., Dept. 33, Latrobe, Pa., or use INFORM-A-GRAM Key No. 33-W.



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- *Fast—easy to operate.*
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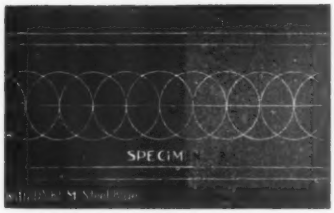

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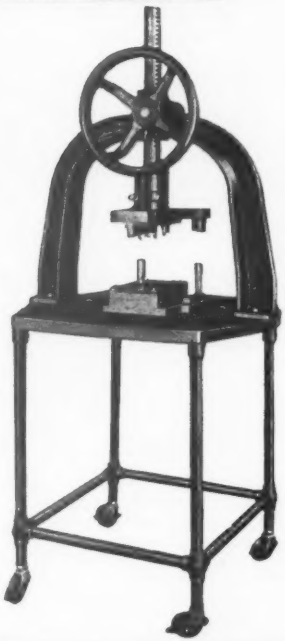
COMPLETE THE DIE-SET AT YOUR BENCH



LACEY DIE-SET MACHINE

Here is a truly "one man" press that operates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves tool room and handling costs.

Positive, true punch-to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

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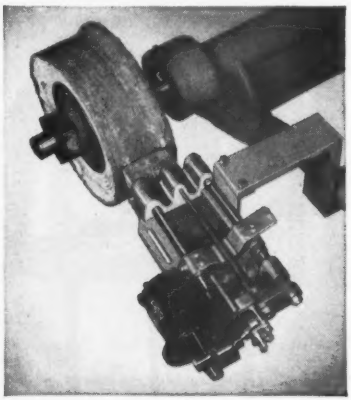
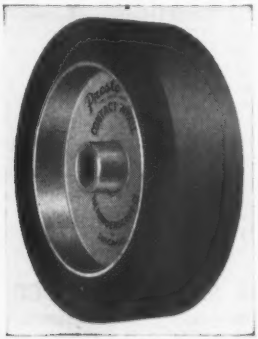
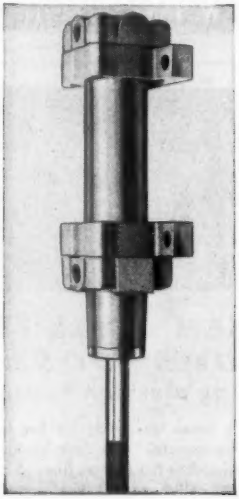


NOW SUITABLE FOR USE WITH SEMI-AUTOMATIC POLISHING LATHES, Presto Contact Wheels have incorporated a five-ply cool-running rayon cord which prevents wheels from getting overheated and losing their shape. Holes through the rubber offer additional cooling action beneath the surface, and also are responsible for the snapping of the abrasive belt as it leaves the work which beats it clean with 72 hammer-blows per revolution of the 14" wheel. Presto Contact wheels are available in 9" and 14" diameters, with 2", 3" and 4" face. Diameters are precisely uniform so that two or more wheels can be used together to produce any desired width. Questions will be answered by THE MANDERSCHEID CO., Dept. 33, 810 Fulton St., Chicago 7, Ill., or use INFORM-A-GRAM Key No. B33-W.



COVERING MOST NEEDS IN INITIAL EQUIPMENT, National Hydraulic Cylinders come with seven standard mountings in bore sizes from 1" to 12", attain a stroke of any length under operating pressures up to 1500 psi with a 5-1 factor of safety. Other special features include cast Meehanite heads, long bronze side-thrust bearings, special alloy steel rods, alloy steel seamless tubing bored and honed to a mirror-like finish, and the elimination of tie rods. All tolerances and concentricity held within given limits. Special forged cylinders for the highest commercial pressures and other cylinders for special needs also can be designed and engineered. Direct inquiries to NATIONAL HYDRAULIC CO., INC., Dept. 81, 4505 Oakwood Blvd., Melvindale, Mich., or use INFORM-A-GRAM Key No. K81-W.



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Roughly sketch desired mandrel into your part print and forward for quotes.

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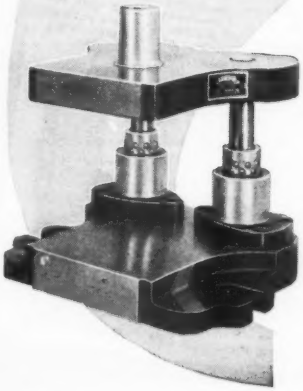
SAVE UP TO 60% OF DIE SETTER'S TIME
WITH LEMPCO ANTI-FRICTION DIE SETS



On one die, Atlantic Tool and Die Company saved 40 hours of assembly and set up time, by using Lempco Anti-Friction Die Sets.

Lempco Anti-Friction Die Sets are equipped with ball or roller bearing guide pins. That's why dies can be set up by hand without the use of hammers, mauls, jacks or pry bars. This eliminates production delays caused by accidents to die and punches—saves up to 60% of die setter's time. Lempco Anti-Friction Die Sets positively eliminate all down-time caused by bound, scored or galled guide pins.

Write for fully illustrated booklet, "Facts About Lempco Anti-Friction Precision Die Sets."

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Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

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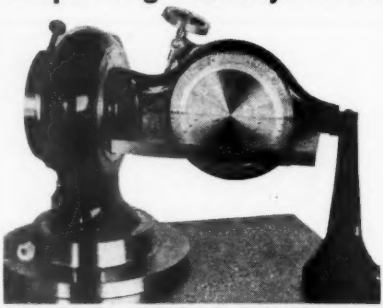

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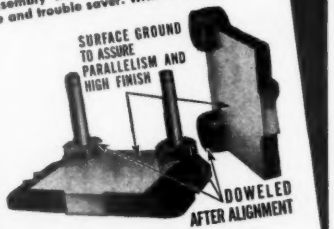

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A SIMPLE AUTOMATIC OPERATION enabling precision grinding of both cutting edges and both angles of drills is made possible by the automatic dial control of the Majestic Drill Sharpener. Adaptable to all grinders, it has a feed adjustment which speeds the sharpening of any drill 5/32" to 1" (straight or No. 2 taper shank). Pictorial literature is available by writing to MAJESTIC DRILL SHARPENER CO., Dept. 65, 1333-5 South Sixth St., Minneapolis 2, Minn., or use INFORM-A-GRAM Key No. H65-W.

ANSWERING THE NEED FOR A COMPACT INSTRUMENT to indicate pressures in mechanical assemblies the new Dillon pressure gage for the first time makes it possible to measure working loads in "tight" spots or inaccessible machine setups. It works equally well with static or moving loads, may be calibrated in kilos and is furnished in six sizes, in ranges for 0-100 to 0-5000 lbs. Write for literature containing photographs of the gage and applications to W. C. DILLON & CO., INC., Dept. 58, 5410 W. Harrison St., Chicago 44, Ill., or use INFORM-A-GRAM Key No. A58-W.

CONTINUING TO USE THE SAME HIGH QUALITY MATERIAL and workmanship, Morton Machine Works presents a new low price list in their M-T catalog. Fixture details and fixture clamps which cut tool cost, save time, and speed operations, are illustrated with descriptive information. Specifications are also given of M-T hardened and ground all over end mill holders. Write MORTON MACHINE WORKS, Dept. 69, 2421 Wolcott St., Ferndale 20, Mich., or use INFORM-A-GRAM Key No. K69-W.

HOW THE BRIGGS OIL FILTER (MODEL SV2) WORKS is clearly explained in a recent catalog issued by The Briggs Filtration Co. A cross section diagram of the filter with the main units is described. Three additional models are shown: model D, D1 and D-DF-JD, designed for specific operating conditions, various capacities and all degrees of contamination. Get specifications and dimensions of all models from THE BRIGGS FILTRATION CO., Advtg. Dept., Bethesda 14, Maryland, or use INFORM-A-GRAM Key No. D73-W.

PRESENT TOOL CAPACITY OF ANY BENCH OR ENGINE LATHE can be increased by 4 to 1 with Enco standard turret tool posts, which features: 12 position indexing, available with machinable base for quick adaptation to lathe and no chip interference. In addition to more tools, larger size tools too can be mounted. Bigger shanks permit quicker tool heat diffusion, greater rigidity and more carbide on tipped tools. The self-indexing turret tool post has an additional feature: cam locking, permitting single-motion, single-handed indexing and locking. Detailed specifications on dimensions and capacity on all models are given in literature available upon request from ENCO MFG. CO., Dept. 30, 4522-24 W. Fullerton Ave., Chicago 39, Ill., or use INFORM-A-GRAM Key No. B30-W.

COMPLETE LINE OF ABRASIVE SPECIALTIES, sharpening stones and oil stone files, manufactured by Norton Company for the industrial supply trade, is presented in recently issued literature. Coated abrasives for the supply trade, made by Behr-Manning, are also illustrated and described with suggestive application of each. For catalog sheets containing data and price list write BEHR-MANNING (DIVISION OF NORTON CO.), Dept. 1-10, Troy, N. Y., or use INFORM-A-GRAM Key No. 110-W.

HOW SPEED PRODUCTIVE CAPACITIES of both machine and operator can be increased on automatic process machines is described by actual case studies in a 28-page circular "Holeway Machines", issued by Natco. Drillers, borers and tappers, built in various sizes with single and multiple spindles, for large or small holes with adjustable and fixed center, can be adapted for specific production requirements. Address inquiries to NATIONAL AUTOMATIC TOOL CO., INC., Dept. 69, Richmond, Ind., or use INFORM-A-GRAM Key No. E69-W.

PROVIDING CLOSER TEMPERATURE CONTROL AT REDUCED COST, a new thermocouple of improved design is supplied with either No. 8 ga. standard chromel-alumel or iron-constantan element and can be used with any make of pyrometer. Send for catalog No. 4 on company letterhead to ARKLAY S. RICHARDS CO., INC., Dept. 42, 73 Winchester St., Newton Highlands 61, Mass., or use INFORM-A-GRAM Key No. 42-W.

PRODUCING FINE SUPER-SMOOTH SURFACE, the Sunnen portable hones provide an economical means of accurately finishing bores from 2" to 14½" diameter. These precision tools for salvage repair, assembly, maintenance, small and lot production, are available in two models No. J-95 Junior hones and A-112 Standard hones. Write for complete data to SUNNEN PRODUCTS CO., Dept. 5-83, 7900 Manchester Ave., St. Louis 17, Mo., or use INFORM-A-GRAM Key No. 583-W.

IN THE FIELD OF SMALL HOLE PRECISION TAPPING the Hamilton super sensitive tapping machine offers "fool-proof" operation; smoothness, silence, precision, and ruggedness. Bulletin T-47 lists specifications of features, capacities, speeds, clearances, travel, mechanical and electrical characteristics, and size and weight. Address requests for bulletin T-47 to THE HAMILTON TOOL COMPANY, Dept. 61, Ninth St. at Hanover, Hamilton, O., or use INFORM-A-GRAM Key No. G61-W.

A COMBINATION CHIP BREAKER AND DIAMOND FINISHING GRINDER, the Hammond CB-77 handles all types of box and single point tools and accommodates all of the required angles. Bulletin 215 contains complete detailed information and close-up illustrations of chip breaker side and cup wheel side of the grinder. Write for bulletin 215 to HAMMOND MACHINERY BUILDERS, INC., Dept. 95, 1600 Douglas Ave., Kalamazoo 54, Mich., or use INFORM-A-GRAM Key No. 95-W.

EIGHT SIZES OF GROBET CHATTERLESS COUNTERSINKS are illustrated in a catalog sheet listing diameters which range from ¼" to 2" with a 41° angle with centerline, prices, length and diameter of shank and over all length. Complete information on these sets packed in wooden boxes is available from GROBET FILE COMPANY OF AMERICA, Dept. 7-05, 421 Canal St., New York 13, N. Y., or use INFORM-A-GRAM Key No. 705-W.

A REPORT ON HEAVY DUTY SPRINGFIELD GEARED HEAD LATHES, bulletin No. 162, outlines detailed parts of the gear box with actual photographs and 39 other parts. Headstock, apron, taper attachment, tailstock, compound rest and draw-in collet attachment are illustrated and discussed. For general dimensions get Bulletin No. 162 from the Springfield MACHINE TOOL CO., Dept. 6-47, Springfield, Ohio, or use INFORM-A-GRAM Key No. 647-W.

VARIOUS MODELS OF THE VACUUM-GRIP SPEED LATHE for odd-shaped parts that cannot be held by chuck or collet are described in a new illustrated 12-page catalog issued by Crozier Machine Tool Co. Features and operations of time-saving tools, tool post turrets equipped with cutting-off tool and holder, collet attachments, collet and surface plates are also listed in catalog 46-1. Write to CROZIER MACHINE TOOL CO., Dept. 2-55, 684 North Prairie Ave., Hawthorne, Calif., or use INFORM-A-GRAM Key No. 255-W.

PROPER SELECTION AND USE OF DIAMOND DRESSING TOOLS for individual exact requirements are simplified with "The Desmond Diamond Tool Reference Guide", a new four-page illustrated bulletin No. D-8. Dimensional data and prices on "Tru-set" diamond hand tools, diamond wheel dressers for valve grinding machine, and straight shank diamond tools and nibs are listed. Copies of bulletin No. D-8 are available from THE DESMOND-STEPHAN MFG. CO., Dept. 2-63, Urbana, Ohio, or use INFORM-A-GRAM Key No. 263-W.

ANOTHER ACHIEVEMENT BY MANCHESTER REPETITION ENGINEERS, LTD., brings forward the radius attachment, universal head. Operating on an entirely new principle the attachment lends itself to work on lathes, surface grinders, cylindrical grinders, milling machines, etc. Various applications of convex and concave radii are listed in an attractive 8-page booklet available upon request from ACCREYLON CO., INC. (U. S. Representatives of Manchester Repetition Engineers, Ltd.), Dept. 70, 130 W. 42nd, New York, N. Y., or use INFORM-A-GRAM Key No. K70-W.

"GEAR HIGHLIGHTS" Vol. XI No. 1, announces standardized Cone-Drive gear sets in 99 sizes and ratios now being carried in stock by the Cone Drive Division of Michigan Tool Co. A factual report on underpass curve-shaving, and dynameter research is made interesting with diagrams and illustrations. A list of new gear literature is also given. Request copies of Vol. XI No. 1 on company letterhead from MICHIGAN TOOL CO., Dept. 47, 7171 E. McNichols Rd., Detroit 12, Mich., or use INFORM-A-GRAM Key No. 47-W.

AS THE RESULT OF MANY YEARS OF EXPERIENCE and continuous research, the American "White-Line" pulleys have maintained a high standard of quality, modern design and accuracy. Bulletin No. 325 contains necessary information to be applied to answer all individual specific pulley problems. Standard construction of iron pulleys are given; tables and listings are also shown with dimensions, prices, etc. Write for bulletin No. 325 to AMERICAN GEAR & MFG. CO., Dept. 71, 5900 Ogden Ave., Chicago 50, Ill., or use INFORM-A-GRAM Key No. K71-W.

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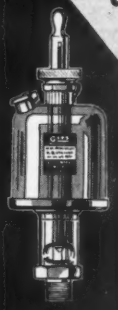

Gits Gravity Feed Oiler controls oil flow by simple turning of a knurled screw. Flow can be shut off completely during idle periods. The transparent reservoir shows quantity of oil present, and rate of flow may be viewed at all times through a sight glass in the shank. Available in several models, Gits Gravity Feed Oilers are especially adapted to high vibration operations. Sizes, models, prices on request.

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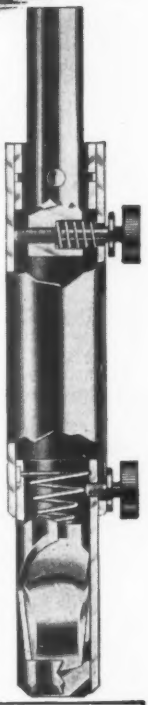

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PROTECTION FOR MEN AND MACHINERY in metal-working shops against buffing, grinding and polishing machine dust, created by individual machines, can be assured with Tornado Dust Exhausters. Easily mounted on any post or wall adjacent to the grinder or underneath the bench, the unit catches all fine particles of dust and exhausts them into a larger bag. ¼ hp to 1 hp motors are available for 110, 220 and 250 volts. Mounting bracket and dust bag, hose connection and 4' hose with moulded rubber ends and 15" lead wires complete the unit. Write for further details to BREUER ELECTRIC MFG. CO., Dept. 66, 5100 N. Ravenswood Ave., Chicago 40, Ill., or use INFORM-A-GRAM Key No. G66-W.

DEVELOPED FOR EXTREMELY HIGH PRESSURES and/or high temperatures, Die Slick No. 5, a special metal-working lubricant, prevents scoring and sticking of metal being formed. It will withstand pressures of more than 100,000 lbs. per square inch and can be used with temperatures up to 2300° F. Containing no graphite, Die Slick No. 5 will increase die life and speed production. Request further information from G. W. SMITH & SONS, INC., 5420 Kemp Road, Dayton 3, Ohio, or use INFORM-A-GRAM Key No. 869-W.

UNIVERSAL, INDEPENDENT, COMBINATION and four special styles of light-duty Wescott Chucks are reviewed in new catalog-type literature just published. Discussing their most popular chuck sizes and styles, this booklet includes many-view photographs, diagrammatic sketches, dimensions, weights and special data lists corresponding to each chuck which apply in clarifying their use with other tools. A new consumer price list is also inserted. Write for Catalog 700 to WESCOTT CHUCK CO., 3500 E. Walnut St., Oneida, N. Y., or use INFORM-A-GRAM Key No. 519-W.

ANNOUNCING THE OPENING OF AN EXPANDED DEPARTMENT for the salvaging of tungsten carbide tipped cutters, the National Tool Salvage Co. now has facilities to accept work in any quantity that involves resharpening of cutters or replacement of a broken tip to the complete alteration of cutters for other operations. A 20-page booklet presents illustrations of work before and after, complete facilities of the plant and various tungsten carbide tools received for salvage. Write NATIONAL TOOL SALVAGE CO., Dept. 7-72, 6511 Epworth Blvd., Detroit, Mich., or use INFORM-A-GRAM Key No. 772-W.

SPEEDING UP THE SETTING OF MANY TYPES OF GAGES, the new Pla-Chek Gage features a reverse checking plate which may be quickly and easily clipped to any one inch step on the Pla-Chek bar. Also increasing its usefulness is a 3" accurate lapped riser, for checking parts in the center of a large surface plate. Write for illustrated literature describing new features, design, speeds, and accuracy. Thread plugs and thread ring gages are also presented. Address requests to CADILLAC GAGE CO., Dept. 61, 20316 Hoover Rd., Detroit 5, Mich., or use INFORM-A-GRAM Key No. B61-W.

EMPLOYING LIGHT METAL AND NEW CONSTRUCTION TECHNIQUES, the streamlined lightweight hydraulic hand pallet truck offered by Lyon-Raymond Corp. is described in their recently published Bulletin 221. Actual photographs showing three views, features and emphasizes the steering arc of 270 degrees, elevation of 4", free movement of front wheel, foot pedal which returns automatically to out-of-the-way positions, and maneuverability. For specifications and other features write for Bulletin 221 to LYON-RAYMOND CORP., Dept. 3-74, 3324 Madison St., Greene, N. Y., or use INFORM-A-GRAM Key No. 374-W.

INTRODUCING A NEW LINE OF COMBINATION CUTOFF AND CHAMFERING TOOLS to users of Brown & Sharpe Automatic Screw Machines, Weldon Tool Co. has issued a folder with explanatory photographs, diagrams, specifications and price lists covering Nos. 00, 0, and 2. This new line will handle chamfering to any desired angle; for the cut-off angle, a 15° option is offered for steel and 23° for brass. Request this booklet from WELDON TOOL CO., Dept. 5-17, 3000 Woodhill Rd., Cleveland 4, Ohio, or use INFORM-A-GRAM Key No. 517-W.

DESIGNED TO EXPEDITE HOLDING OPERATIONS, injection and ejection of production items, Air-Trol Cylinders with spring return fast action, features simplicity in design, high strength, bronze ram bushings, synthetic piston cup, non-rusting heads and true bore cylinders—to effect the elimination of operator fatigue and wasted time. These cylinders are guaranteed against defective workmanship and materials. Get literature, including price list, diagrammatic sketch and actual photograph by writing AIR-TROL, Dept. 38, 2651 W. Lake St., Chicago 12, Ill., or use INFORM-A-GRAM Key No. K38-W

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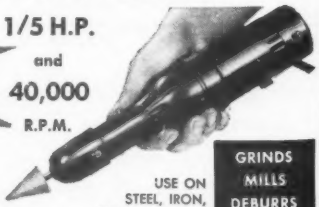

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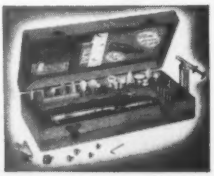

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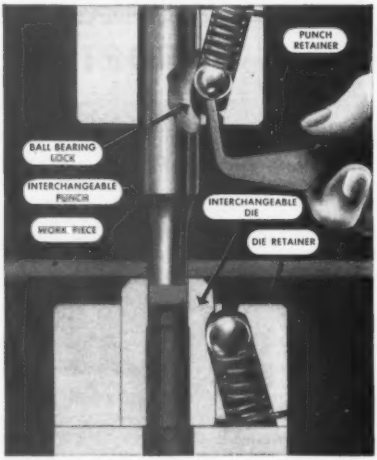

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A NEW SERVICE TO THE METAL-WORKING INDUSTRIES has been established by the Reynolds Metals Co. They are now publishing the "Technical Advisor," a monthly technical paper devoted to publicizing the latest recommendations on the most effective use of aluminum mill products. The first issue carries a condensed technical description of the Bayer and Hill processes used in the production of aluminum and a technical process serial article devoted to the welding of aluminum; general factors involved, weldability of various aluminum alloys, application of gas welding and edge preparation for gas welding. This periodical is sent free upon request from Technical Editorial Service, Reynolds Metals Co., 2563 South Third St., Louisville 1, Ky., or use INFORM-A-GRAM Key No. K64-W.

FOUR TECHNICAL PAPERS COVERING GENERAL INFORMATION about cutting fluids, their testing, selection and cutting feeds and speeds, are included in Technical Bulletin No. 5, "Cutting Fluids and Coolants", available from D. A. Stuart Oil Co., Ltd. This 36-page text consists of the papers presented before leading authorities in the cutting fluid field at the American Society of Tool Engineers New Era Exposition. Free copies of this bulletin and also preceding issues are available upon request from D. A. Stuart Oil Co., Ltd., Dept. 6-13, 2729½ S. Troy St., Chicago 23, Ill., or use INFORM-A-GRAM Key No. 613.5-W.

THE NEW RESISTANCE WELDING MANUAL to meet the information requirements of engineers, production executives and machine operators, includes twenty entirely new chapters, revised tables of recommended procedures and numerous other additions on operating data based upon research and experimental work conducted during the war production period. A separate chapter is devoted to each group of metals in the section on resistance welding procedures and a new section contains chapters on Quality Control, Instrumentation and Standard Tests with supplementary discussions. Also included are a glossary of the latest approved definitions used in the industry and up-to-date collection of useful tables. Published by the Resistance Welder Manufacturers' Association, Dept. 80, 505 Arch St., Philadelphia 6, Pa., $3.00 postpaid.

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SELECTING EXACTLY THE RIGHT DRILL CHUCK for any straight shank drill is now made easy by means of a "slide-rule" type selector offered by Scully-Jones and Company. With one simple setting of this selector, the catalog number of the style "B" drill chuck

to be requisitioned can be determined instantly. In addition, the selector shows recommended speeds and feeds for drilling various types of materials. To get one of these Scully-Jones Drill Chuck selectors, write them on your company letterhead addressed to 1913 South Rockwell St., Chicago, Ill., requesting the drill chuck selector that was described in the TOOL & DIE JOURNAL.

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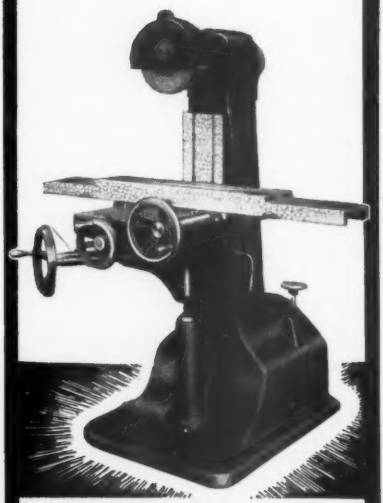

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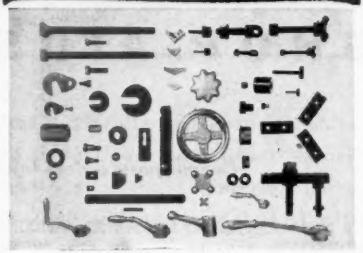

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MODEL A—A 3-way valve, actuated by some motion from the machine to which the table is to be synchronized, allows compressed air to move a hardened and lapped piston to operate the Pawl arm. The Pawl indexes the plate and LOCKS it in the indexed position until the valve is released allowing a spring to return the Pawl, ready for the next indexing.
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MODEL B—This model is an adaptation of Model A wherein a special control valve is incorporated so that the plate is automatically self-indexing. By merely turning a screw, speed is adjustable from one indexing each half second to one each ten seconds. The table is locked in position between indexings. Recommended for soldering, assembly, etc., operations where no mechanical motion is available.
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Standard 12-position Index Plate
All working parts hardened

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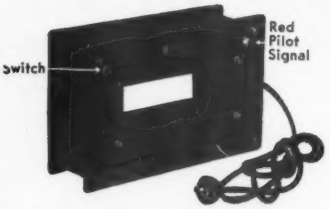

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A Tooling Program

(CONTINUED FROM PAGE 78)

This shaving operation is taken as a precaution to compensate for any difference in tolerance which may exist between the indexing tolerance of the machine spindles and the tolerance specified for the part.

The internal forming and cutting off of the packing follower are the operations performed at the fourth position, D, Figure 37. The step counterbore enlarges the 21/64″ diameter hole (.3281″) to .379″ and forms a 90° included angle countersink at the bottom of the follower. The purpose of this countersunk shape is to permit mating with the shape of the molded packing, N, Figure 24. The step counterbore tool is set up on the main tool-slide and the cutoff tool is on the cross-slide of the fourth position. The operational timing of these two tools is such that the step counterbore mounted on the main tool-slide moves into the work, completes its reaming operation, and retracts clear of the workpiece before the cutoff tool finishes cutting off the piece.

This cycle of operations completes the machining of the packing follower, except removing the burr thrown up by the cutoff tool.

(To Be Continued)

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A very complete description of buffing and polishing wheels is contained in a new brochure just issued by the American Buff Company. Buffs of unbleached and bleached muslins, flannels, duck and other materials with spiral, concentric, radial, radial arc, spiral-radial arc, parallel wave, parallel and "V" sewed construction are illustrated and described. Polishing wheels made of cotton cloth canvas, duck, felt, walrus leather, sheepskin, and bullneck leather are listed with their typical applications. A data sheet giving the determination of the peripheral speed of a wheel for the most efficient operation is included. Contact the American Buff Co., Dept. 83, 711 West Lake St., Chicago 6, Ill., or use INFORM-A-GRAM Key No. K83-W.

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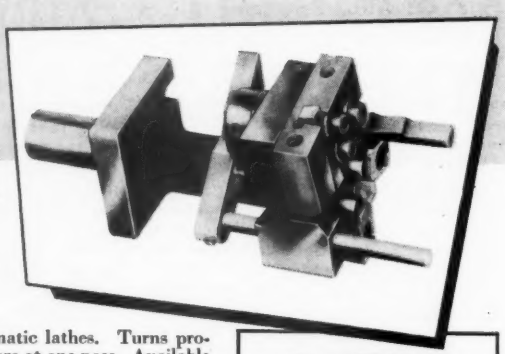

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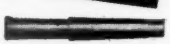

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Attaching And Replacing Carbide Parts

A method has recently been developed which makes it possible to mount or attach carbide parts by means of screws, studs, etc., in the same manner and with the same ease as is experienced with parts made of softer metals such as steel, bronze, cast iron or aluminum.

This development greatly expands the potential fields of application for carbides, and is particularly effective where large carbide sections are to be used. Heretofore, the use of large sections of carbides has been handicapped to some extent by the fact that carbides in the hardened state are unmachinable to all practical purposes and cannot be drilled or tapped.

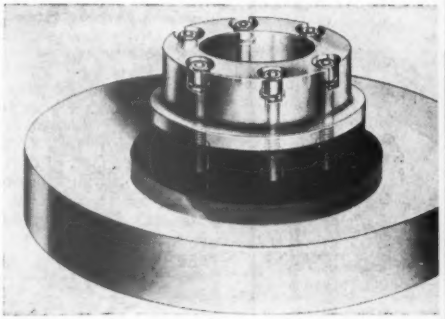
This objection has been overcome by solidly imbedding a machinable material in the carbide wherever the part is to be machined. An outstanding feature of the development is that it permits the use of tapped, blind holes in the attaching side of the carbide. This in turn means that large "wear parts" may be bolted down rigidly and still present a wear resisting surface unbroken by through holes.

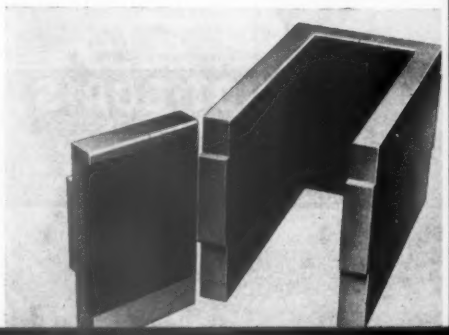
When it is desired to attach carbides by means of studs or screws, the approximate locations of the points of attachment and the number of such points are first determined. The carbide part is then provided with machinable inserts in those locations. The part may then be drilled and tapped at those points either before shipment from the carbide supplier or on the job by the user.

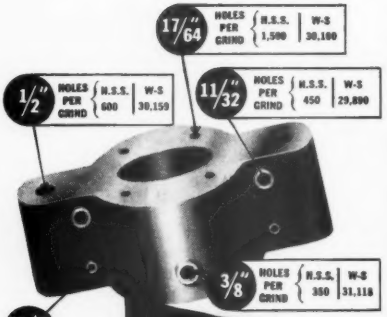
Fig. 2. An example of the new method of building-in carbide components. This carbide lined ceramic mold is indicative of the potential cost reduction that can be effected in complete assemblies.

The method, although new, has been in actual manufacturing use for some time in various types of applications on both small and large parts. The accompanying illustrations cover a few typical examples which, of course, do not indicate the complete range of usefulness of the attaching method. Among the great variety of potential applications which suggest themselves are those involving compound, progressive and segmental

Fig. 1. Phantom view of carbide punch and die member secured to solid steel backing by means of screws and threaded inserts imbedded within the carbide.



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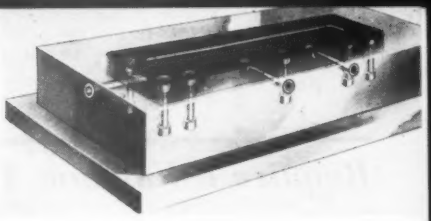

Fig. 3. Sectional carbide dies may be easily and quickly assembled by the new Carboloy attachment method. This phantom view of a deep drawing die shows some of the attachment points. The carbide portion is over 12" long.

blanking dies, wear parts in fixtures, crank guides, cams, liners for molds and mills, punches for stamping and embossing, machine ways, guides, work rests and shoes, as well as wear plates on precision instruments.

In dies, the ability to attach carbides with threaded parts has the important additional advantage of permitting the carbide to seat solidly against the backup metal, thus greatly increasing impact resistance as compared to attaching similar parts by brazing. The importance of this in carbide dies for blanking and piercing is readily appreciated.

Obviously, the development indicates a very considerable reduction, by the very nature of its simplicity, in the cost of attaching large carbide parts, and also lends itself to the economical building up of a complex-shaped die or other part with groups of small individual units fitted together and held down, as in a progressive die. Not infrequently, the cost of attaching carbides or providing for their attachment has been considerably greater than the cost of the carbide part itself.

Where expansion problems are involved, the hole or holes in the support member may be countersunk and made slightly larger than the bolt diameter. The bolts can then be screwed into the threaded insert and spring loaded. This insures firm seating of the carbide, yet allows for creep in case of differential expansion. At the same time the entire wear surface of the carbide remains solid and unbroken.

There are few limitations as to the applicability of this new mechanical assembly method for carbides as developed by the Carboloy Company. Large parts may be made either in one piece or in sections and attached by any desired number of threaded holes. In the other direction, the process has been applied, using a threaded blind hole, to mounting of parts as small as 5/16" OD and ⅜" thick or long, such as replaceable solid carbide punch ends.

Fig. 4. In this 5-stage progressive lamination die, the female members for the first, second and third stages are attached to the steel die block by the new mechanical attachment method. The large carbide punch for the first stage and the two punches for the third stage are secured in the same manner. All working parts of this die, as shown in its Lempco anti-friction die set, are of Carboloy cemented carbide, including dies, punches and guide and locating pins.

As to the strength of the attaching method, repeated tests have demonstrated that the maximum pull exerted in tightening the screw, bolt or stud does not pull out the inserted metal or damage the threads. The bolt actually will fail in tension before it will either pull the metal or injure the threads. Usually when a bolt has failed in this manner, the portion in the thread can be readily unscrewed and a new one inserted. Such severe overload test conditions rarely occur in actual use.

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Cerrolow-147	*147° F
Cerrolow-174	174° F
Cerroseal- 35	*244° F
Cerroseal- 25	*294° F

*Non-eutectic alloys—yield temperatures are those given.

Suggested and actual uses: Fusible links in automatic fire alarm and extinguisher devices; in manual reset thermal switches for controlling processing; or for signalling rise of temperature, as in bearings; thermal safety controls in refrigeration, diathermy and electronic equipment. As a proof casting medium for delicate machine work, Cerrolow-117 can be poured without fear of over expanding metal parts and shrinks but .0002″ per inch after casting.

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Simplified Circular Relief Grinding

Due to the high production that is demanded of, and delivered by, cutting tools, any appreciable increase in efficiency of cutting tooth shape and performance becomes multiplied into impressive production dollar savings. Such an increase in efficiency of cutting tooth shape and performance can be demonstrated in theory and practice by what is known as circular (radial or eccentric) relief.

Figure 1 shows in cross section the profile of reamer teeth that have been given a circular relief grind. The difference between this style of relief or clearance and the more common flat land of 1/64″ to 1/32″ width immediately adjoining the cutting edge, followed by one or two flat, tangential, backed-off surfaces is readily apparent.

One of the principal deterrants to a more widespread recognition and application of the benefits of circular relief has been the relatively complicated mechanical setups that have had to be employed to attain it; highly specialized, single purpose fixtures, involving cam-actuated movements, all of which often had to be laboriously reset for each change in tool style, size or degree of tooth relief.

The attaining of circular relief has been greatly simplified and streamlined by the design, construction and operation of the Cleveland Circular Relief Grinder. All of the mechanical functions necessary for imparting circular relief to cutting teeth are integral, built-in features; but the machine is in nowise limited to circular relief grinding because it can be adapted very simply to conventional surface grinding operations.

A setup for the circular relief grinding of milling cutter teeth is illustrated in Figure 2. The diamond dresser is mounted above the wheel, and by means of its adjustments the grinding wheel is readily dressed concave to the exact curvature of the cutting edge, Figure 3.

For a 3″ reamer, the wheel is dressed to a curvature of 1½″ radius. Inasmuch as this conforms to the diameter of the reamer, the actual eccentricity of relief is attained by a table adjustment which offsets the cutter center from the (projected) center about which the diamond dresser swings.

This establishes the desired clearance and then the circular relief or back-off is ground into the tooth clear to the cutting edge by one pass of the work.

The amount of table offset in thousandths is easily charted, Figure 5, for

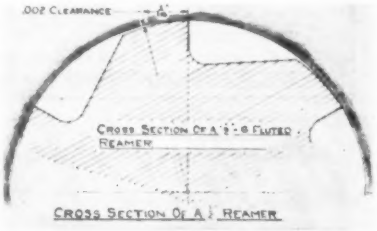

Fig. 1. The circular relief form that is dressed into the wheel and the amount that the table is set over combine to give a .002″ clearance 1/16″ behind the cutting edge.

Fig. 2. After the edge of the wheel has been dressed concave, the table is set over for the proper relief and one pass of the work grinds the circular back-off into the tooth.

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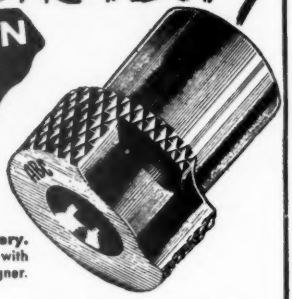

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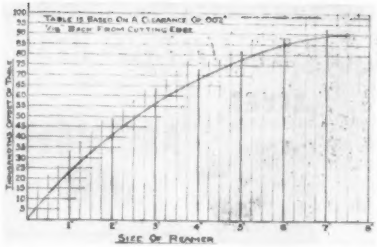


Fig. 5. Curve showing distances that grinder table centers are set over from the diamond dresser center in order to grind to the desired eccentricity.

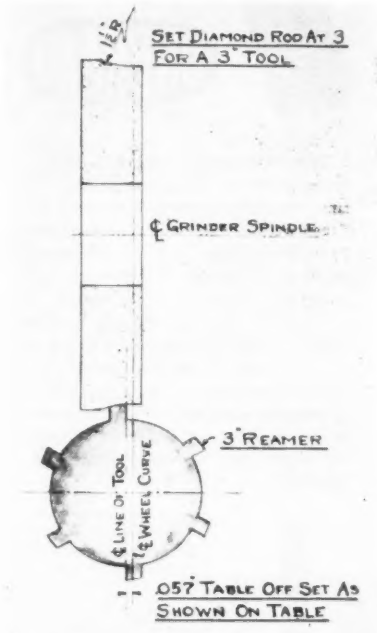


Fig. 3. Showing the relationship between the center line for dressing the wheel and the tool grinding center line after the table is set over.

Further information and detailed specifications may be had from Grinders & Fixtures, Inc., 1255 West Fourth Street, Cleveland 13, Ohio, or by using our postage-free Inform-A-Gram Key No. A82-W.

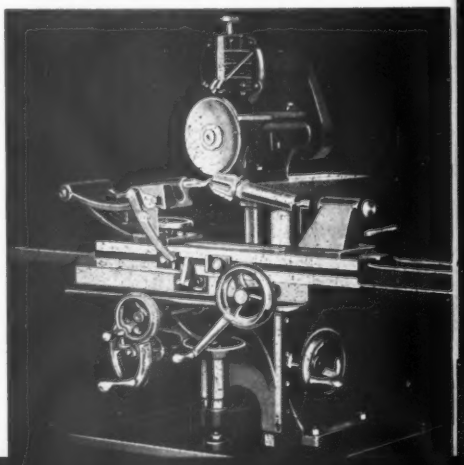
all cutting tool diameters. A simple gaging fixture is used in connection with the table infeed to set the tool holding centers on a line common with the diamond dresser center. From this reference point the table is offset the necessary number of thousandths to give, for instance, a .002″ clearance 1/16″ back of the cutting edge, Figure 1. This offset ranges from .005″ for a ¼″ OD cutter to .090″ for a 7½″ OD cutter, and is read directly on the micrometer scale of the table infeed hand wheel.

Figure 4 shows the setup on a Cleveland Circular Relief Grinder for a stub taper reamer, and shows the manner in which the "headstock" center is raised in order to bring a tapered tooth parallel to the table travel. The center elevating control is calibrated so that for a known taper and distance between centers the setting is easily made and can be accurately repeated or duplicated.

Removing the tool supporting centers from the T-slotted grinder table is all that is necessary to convert to surface grinding operations.

Circular relief of cutting teeth can result in greater work dimension accuracy, better cutting action, longer tool life between grinds, faster tool maintenance, reduced salvage, and improved product quality.

Fig. 4. The setup for the circular relief grinding of a stub taper reamer.



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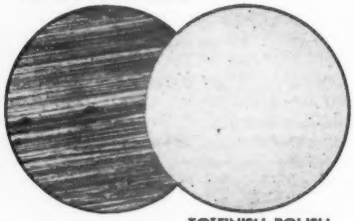

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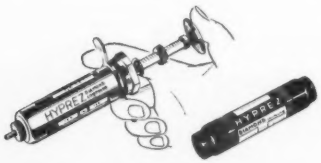

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Out-of-Parallel Presses Economically Corrected

Most punch press equipment found to be out of alignment is, in the majority of cases, due to the out-of-parallelism of the ram and bolster. Evans Reamer and Machine Co. recently introduced the Evans Die-Aligners, Figure 1, which have been designed to eliminate misalignment due to out-of-parallelism between the ram face and the bolster. These consist of matched spherical plates, one concave, the other convex. Both have outside flat surfaces. Because of the spherical radius used, a correction of 1/32" to 1/16" can be obtained. An error of .025" in the alignment of a punch press is considered very serious, therefore the correction range of 1/32" to 1/16", obtained by the radii employed in the different sized plates, will correct the worst error of misalignment.

The Evans Die-Aligners are installed either between the press bolster and die holder or between the press ram and punch holder. Die sets without shanks are set up with the punch holder bolted to the ram. To apply the die-aligners between the press ram and punch holder, holes are drilled in the die-aligners to match the holes in the punch holder. Figure 2 illustrates the die-aligners placed between the press bolster and the die holder and the position taken by the die-aligners when making a correction setup.

Evans shank ball joint, Figure 3, is used in connection with the die-aligners when the punch holder has a shank and the die-aligners are set up between the ram face and the punch holder.

The possible position taken by the die-aligners in this kind of setup is shown in Figure 4.

The die-aligners are made from semi-steel of special analysis, machined, and cadmium plated to assure long service life. The thickness of the two plates varies with the size, but in no case in sufficient amount to interfere with the shut height of the press. They are manufactured in eleven sizes ranging from 6" x 6", the smallest, to 14" x 18" and 16" x 16", the largest.

Evans Die-Aligners are licensed under the inventions of Guy Conner.

Complete details and installation data are included in literature available on request from the Evans Reamer and Machine Co., Dept. 7-33, 529 S. Main St., New Lexington, Ohio, or use INFORM-A-GRAM Key No. 733-W.

★

Fig. 1. Evans Die-Aligner plates showing the convex surface of the top plate and the concave surface of the bottom plate. Fig. 2 illustrates the Evans Die-Aligners placed between the press bolster and the die holder. Fig. 3. Evans shank ball joint used with shank die sets and die-aligners. Fig. 4 shows the possible position taken by the die-aligners when placed between the ram face and the punch holder.

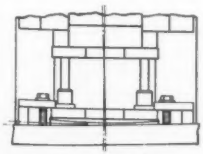


FIGURE 2

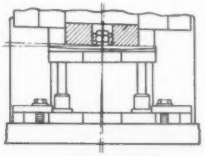
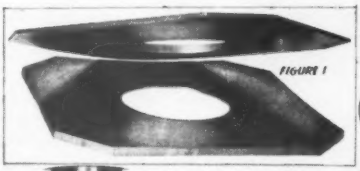


FIGURE 4



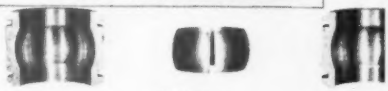
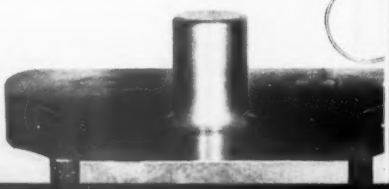


FIGURE 3



Progressive Die

(CONTINUED FROM PAGE 72)

roughly twice as great as that of pin B.

As punch P5 continues its descent, the ears shown in Figure 3, fifth station, are bent 45° downward and, at the same time, it completes the progressive bending of the tabs which started at the third station. With the completion of the stroke, pad C is fully compressed and around edge D of punch P5 the semi-circular projection of the workpiece, Figures 2 and 8, is bent to a 90° angle as the work is carried down into the die opening.

With the completion of all bending operations at the fifth station, spring pad C returns the finished piece to the surface of the die, and from there it is removed by a shot of air.

Although specifically designed to produce these parts in aluminum, this progressive die was tested on cold rolled steel strip of the same thickness; the parts produced from the steel stock were of the same quality as those manufactured from aluminum.

High speed progressive dies are well suited for large scale production. These tools are expensive to manufacture, but once completed, many operations can be quickly and consecutively made and a completed part turned out with each stroke of the press. Large scale production will rapidly cover the cost of the more intricate progressive dies, with decreasing production requirements being balanced by increasing simplicity in design and construction and consequent lower cost of manufacture.

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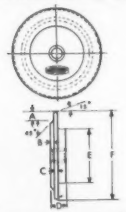

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00-50	00	3 16	.0975	1 16	.050	1 4	1 19 64	1.750	4.00
00-60	00	1 4	.131	1 16	.060	1 4	1 19 64	1.750	4.00
00-80	00	3 8	.1985	1 16	.080	1 4	1 15 16	1.750	4.00
0-60	0	3 8	.1935	3 32	.060	5 16	1 5 8	2.250	4.50
0-80	0	1 2	.261	3 32	.080	5 16	1 5 8	2.250	4.50
0-90	0	5 8	.3265	3 32	.090	5 16	1 5 8	2.250	4.50
2-60	2	3 8	.1935	1 8	.060	3 8	2 7 32	3.000	5.60
2-90	2	5 8	.3265	1 8	.090	3 8	2 7 32	3.000	5.60
2-125	2	1	.5234	3 32	.125	3 8	1 29 32	3.000	5.60
2-156	2	1	.5318	3 32	.156	3 8	1 29 32	3.000	5.60

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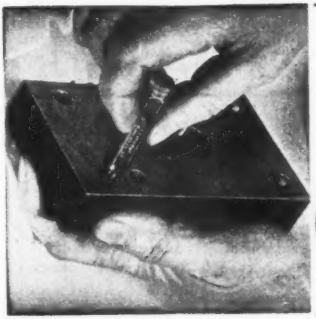

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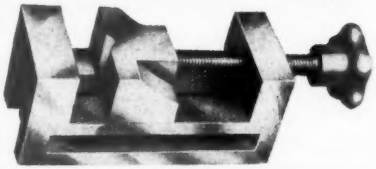

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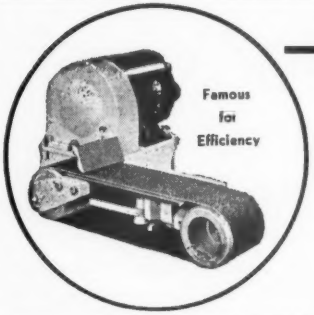

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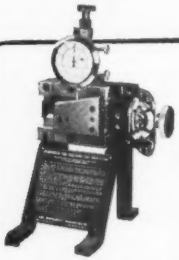

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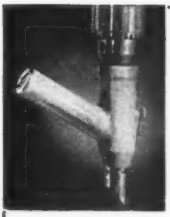

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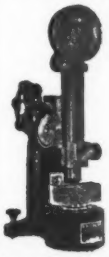

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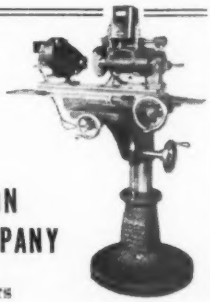

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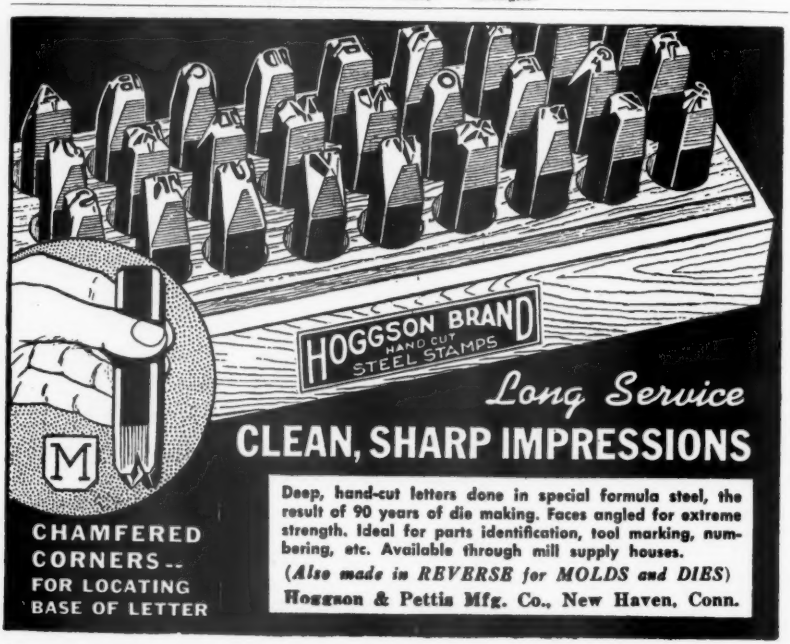

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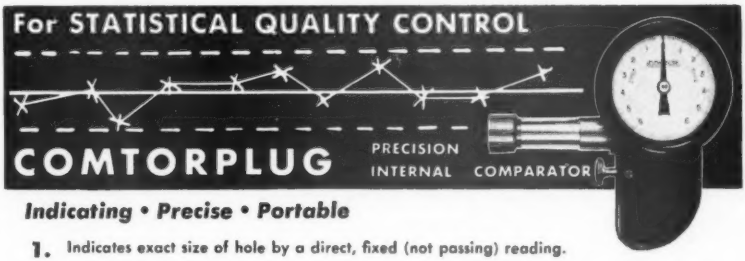

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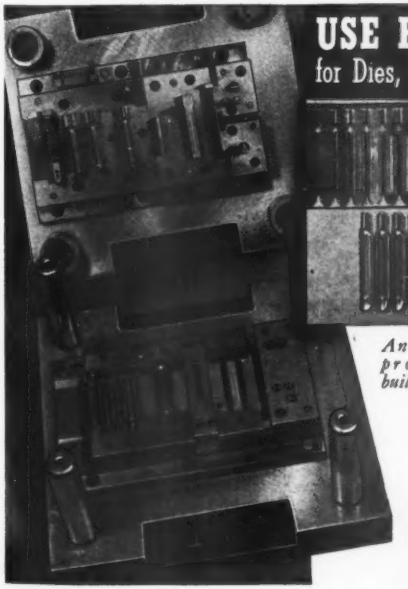

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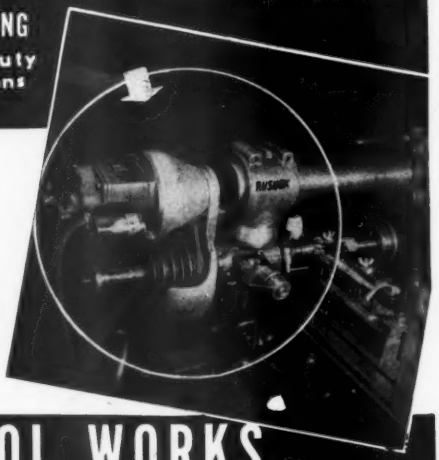

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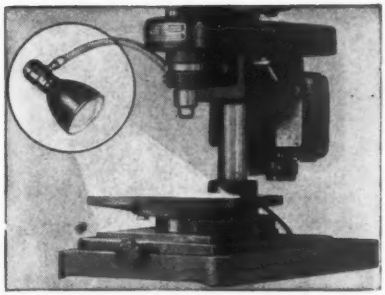

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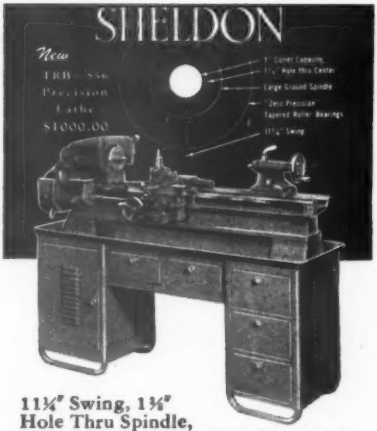

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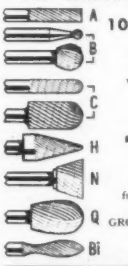

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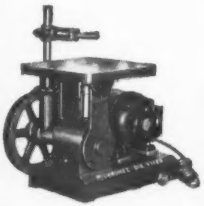

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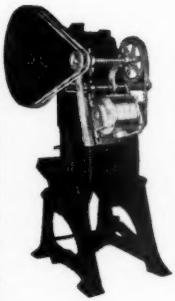

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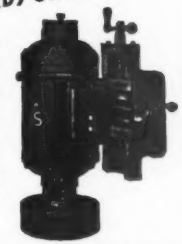

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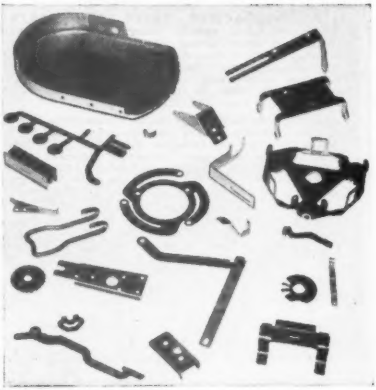

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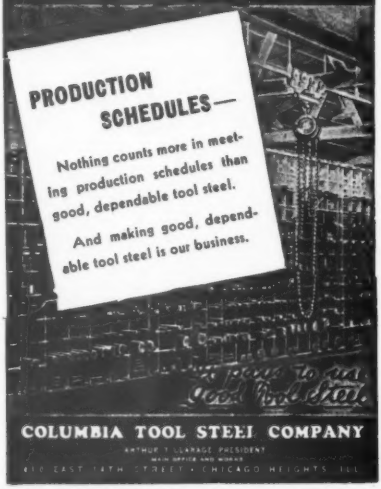
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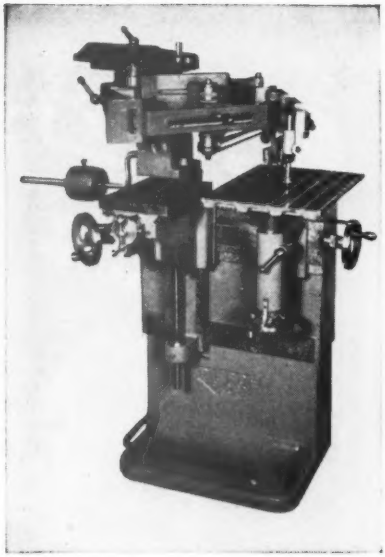

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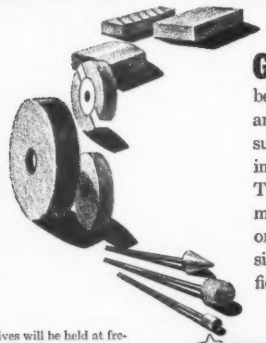

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DRIVE-ALL Selective Speed

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Designed for Industrial Machinery—

Adaptable for new machinery manufacture, or for reconversion of countershaft-driven machines to individual motor-drive.

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Tandem Assembly for Heavy Duty Slow Speeds

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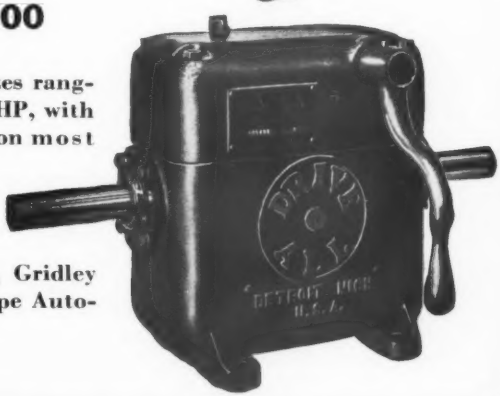
Also available in sizes ranging from ½ to 15 HP, with clutch optional on most models. Special equipment for ultimate low-speed operation, and for Cleveland, Gridley and Brown & Sharpe Automatic Machines.



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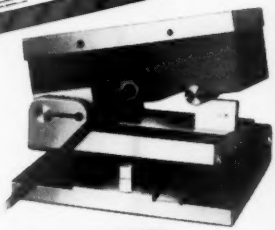
Accurate ANGULAR SET-UPS

Simple as A B C
A
Look up the desired angle in the Table of Constants furnished with each Magna-Sine. Table indicates the proper gage block, or gage block set-up.
B
Select the proper gage blocks from your standard set.
C
Insert the proper gage blocks between the roller on the top plate and the base of the unit. There is nothing more to do . . . the angle is set up accurately, securely.
COMPARE THIS TO OTHER METHODS
. . . THINK OF THE SAVING!



The Magna-Sine is built in two styles; one for single and compound angles, the other for single angles only. Each style is available in two sizes. The work, held by magnetic attraction, is clamped or released instantly.

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